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# How do learners make use of mobile technology and with what consequences?

by

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A thesis submitted in partial fulfillment of the requirements for the degree of  
Doctor of Philosophy in Education

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I certify that all material in this thesis which is not my own work has been  
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# **How do learners make use of mobile technology and with what consequences?**

## **ABSTRACT**

### **Background**

We live in a rapidly transforming society where digital technologies are shaping the way that we function and learn. One key area in which change has been noticed is in the field of mobile learning. Current and past literature has explored the nature of mobile learning and the opportunity that mobile technology affords learners to bridge constraints of time and distance. This research presents a reframing of our understanding of mobile learning through a critical exploration of attributes including ubiquity, immediacy, convenience and mobility. The thesis allows a shift in understanding mobile learning from novel gadgetry towards a valuable tool for learning. Traditional teaching and learning theories and strategies are questioned as new mobile technologies take hold.

### **The aim of the study**

The innovative use of mobile technologies is the focus of this thesis. The context is professional midwifery education. This is an area in which limited research has been carried out. The study is based around a central question, how do learners integrate the use of mobile devices in professional learning? This study explores how learners made use of mobile technology for learning and if the learners' attitudes were influenced by the opportunities afforded to them by digital technologies. The research explores the type of mobile devices the learners had and how these were used. It examined, from the learners' perspective, the benefits and challenges of mobile learning. The potential consequences of embracing mobile technologies within midwifery education were also explored.

### **Design**

This is an interpretive qualitative bounded case study design. The case study provides an intensive, holistic description and analysis of a single cohort of second year student midwives (n=34) undertaking a BSc (Honors) Degree in Midwifery. The case study approach allowed for an in-depth explanation and understanding of the complex behavior patterns within this group of learners and their hand-held mobile devices. A mixed method research approach was used including questionnaires, interviews, focus groups,

and scores collected pre- and post-Objective Structured Clinical Examination (OSCE) to assess clinical skill acquisition following use of a bespoke mobile device Application.

The quantitative data from the questionnaires in the study answered '*what*' students used the mobile devices for in relation to learning. Similarly they provided answers to '*how many*' students owned a mobile device, the type of device and the frequency (*how often*) with which they used a mobile device for learning. It also gave insight into the use of the bespoke shoulder dystocia App. Qualitative data methods such as the interviews and focus groups illustrated '*how*' they used their devices and '*why*' they chose to use particular tools. Data triangulation from the interviews, focus groups, questionnaires and OSCE analysis enhanced the credibility of this study.

## **Findings**

The case study presents a picture of the ways in which students engage with digital technologies for learning and the influence social connectivity has on students' engagement with the world around them. The findings show that mobile devices release the boundaries of physical location and that the learners seamlessly and rapidly switch between learning and everyday interaction on the move. In addition, the introduction of a bespoke App to enhance learners' knowledge and clinical performance contributes to learning by providing a simulated experience, which can be view repeatedly beyond the classroom.

Perceived benefits and challenges of mobile learning are revealed and considered from the learners' perspective. Based on the findings of this study the recommendation is made, that mobile learning should be appropriately embedded into the midwifery curriculum as it can provide learners with deep, meaningful learning experience in the context of today's digital landscape.

## **Conclusion**

From the findings a model is offered to shape the use of mobile devices within the midwifery curriculum. The model sets out how to develop a symbiotic approach to adopting mobile learning. It is valuable as the model draws on theoretical understanding of mobile learning and how the use of mobile devices can support meaningful connections within a community of learners across different learning spaces both within

a social and professional context. This study helps in focusing attention from learning as driven by the device to learning being driven by the use of the device. It captures the ecology of real world learning experiences that midwifery learners' encounter and argues for a symbiosis between mobile learning and face-to-face learning.

Clinical education is fundamental to professional midwifery education and competency-based education forms its foundation. This thesis recommends integrating the use of mobile technology and mobile learning into the context of midwifery education. This means more than making learning activities digital, technology needs to be integrated in a meaningful way so as to enhance learning, increase knowledge, enrich communication and augment contexts for authentic learning that engage students in their world. Learning can be enhanced through the use of bespoke Apps, for example to enhance the learners' knowledge and clinical performance of an obstetric emergency.

## **ACKNOWLEDGEMENTS**

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## TABLE OF CONTENTS

1.0 CHAPTER 1 - Introduction	1
1.1 The Study Design	1
1.2 Stepping Stones	3
1.3 Professional Learning	8
1.3.1 The Course	8
1.3.2 Professional Midwife	11
1.4 The Structure of the thesis	13
1.5 Chapter Summary	14
2.0 CHAPTER 2 - Literature Review	15
2.0 Introduction	15
2.1 Accessing and selecting the literature and data	15
2.2 Exploring mobile learning (mLearning)	24
2.3 Technology and learning	28
2.4 Pedagogical approaches to support mobile learning	33
2.5 Mobile learning in context with professional nursing and midwifery education	52
2.6 Chapter Summary	61
3.0 CHAPTER 3 - Methodology	63
3.0 Introduction	63
3.1 Research design	63
3.1.1 Ethics and research access	67
3.1.2 The Setting, sampling and study participants	69
3.1.3 Data collection	74
3.1.4 Learning Apps, Questionnaire and OSCE	74
3.1.5 Focus Groups and Semi-structured interviews	76
3.2 Analysis and reporting the study	78
3.2.1 Objective Structured Clinical Examination (OSCE)	79
3.2.2 Survey Questionnaires	81

3.2.3 Focus Groups	82
3.2.4 Semi-structured interviews	83
3.3 Chapter Summary	86
4.0 CHAPTER 4 - Findings	88
4.0 Introduction	88
4.1 Findings: Learning with bespoke App and OSCE	89
4.2. Findings: Survey questionnaire	93
4.2.1 Theme: Access and types of device	94
4.2.2 Theme: Use of technology (mobile devices)	95
4.2.3 Theme: Communication and Social use	96
4.2.4 Theme: Organising, function and recreation	98
4.3 Findings: Focus groups and semi-structured interviews	100
4.3.1 Theme: Access and social use of Technology	101
4.3.2 Theme: Organisation, function and recreation	102
4.3.3 Theme: Communication and connectivity	103
4.3.4 Theme: Immersion in technology, challenges and behaviour	108
4.3.5 Theme: Engaging the learner and learning on the go	116
4.4 Chapter Summary	121
5.0 CHAPTER 5 – Discussion	123
5.0 Introduction	123
5.1 What mobile devices do the learners have and what do they use them for?	123
5.2 What do learners perceive to be the benefits of mobile learning?	125
5.3 How learners make use of mobile technologies and with what consequences?	129
5.4 Does bespoke learning material have a place in mLearning?	129
5.5 Integrating mobile devices into professional learning.	132
5.6 Integrating into a Social and Technological Ecosystem	136
5.7 Chapter Summary	146
6.0 CHAPTER 6 – Conclusions	146
6.0 Introduction	146
6.1 Research Questions	146
6.2 Contribution of this thesis	147

6.3 Limitations of the study	148
6.4 Recommendations for future teaching and learning	149
6.5 Recommendation for future research	151
6.6 Final thoughts	151
REFERENCES	153
BIBLIOGRAPHY	168
Appendix 1 – Figure 1 A task model for mobile learners	170
Appendix 2 – Figure 2 Mobile learning episodes in the semiotic space Figure 3 Mobile learning episodes in the technological space	171
Appendix 3 – Ethical Approval Application form	172
Appendix 4 - Research Participant Consent Form	179
Appendix 5 - Research Participant Consent Form Research Participant Reusable Learning Object Consent Form	181
Appendix 6 – Participant Information	186
Appendix 7 - OSCE Marking Criteria: Managing Shoulder Dystocia	187
Appendix 8 - Survey Questionnaire	190
Appendix 9 - Focus Group Guidance	195
Appendix 10 – Guidance questions for Semi-structured interviews	197

## TABLE OF TABLES

<b>Table Title</b>	<b>Page</b>
Table 1 - FINER model	16
Table 2 - Mapping keywords	17
Table 3 – Inclusion and exclusion criteria for literature search	17
Table 4a - CINAHL - key search terms and results (mLearning)	19
Table 4b - CINAHL - key search terms and results (mobile technology)	19
Table 5 – Sample of included literature for review	22
Table 6 - Early features associated with mLearning	27
Table 7 - Development of definitions and early features associated with the term mLearning	27
Table 8 - Key features of Learning Theories	35
Table 9 - New theories of teaching and learning with mobile technology	51
Table 10 - Participant details	72
Table 11 - Pre-test and post-test results from using the App as reported by OSCE results	80
Table 12 - Type of mobile device owned by students in the study	81
Table 13 – Sample showing preliminary assignment of themes	85
Table 14 - Summary of data from pre-test and post-test OSCE	89
Table 15 - Summary of module outcomes for Cohort (2016/2017) with no access to the shoulder dystocia App.	90
Table 16 - Distribution of marks across each of the assessment criterion in the OSCE	91
Table 17– Make of device owned by students	94
Table 18 - Type of activity with mobile device by category	96

Table 19 - Types and use of social media Apps by students	97
Table 20 – Sum of responses of mobile devices	99
Table 21 – Recreational use of mobile devices	100
Table 22 – The frequency with which key terms were observed in the data	104
Table 23 - Perceived benefits of mobile technology	108
Table 24 - Location when using mobile technology	109
Table 25 - Challenges with mobile devices	111
Table 26 - Key features of how mLearning had changed the way individuals learn	118

## TABLE OF FIGURES

<b>Figure Title</b>	<b>Page</b>
Figure 1 – A flow diagram of the search process	21
Figure 2 - FRAME – the Framework for mobile learning	31
Figure 3 – Data collection methods	74
Figure 4 - Location when using mobile device	82
Figure 5 - E-social E-Tech Ecosystem of learning	140

## TABLE OF IMAGES

<b>Image Title</b>	<b>Page</b>
Image 1 - Features within the shoulder dystocia App	64

## **ABBREVIATIONS**

AAPS – Application

CETL – Centres in Excellence for Teaching and Learning

CIPeL – Centre for InterprofessionaL Learning

CPD – Continuous Professional Development

HEA- Higher Education Academy

HEI – Higher Education Institute

LME – Lead Midwife for Education

NIPE – Newborn Infant Physical Examination

NMC – Nursing and Midwifery Council

OSCE – Objective Structured Clinical Examination

RLO – Reusable Learning Object

RTMP – Return to Midwifery Practice

SDA – Shoulder Dystocia App

UCAS- University and Colleges Admissions Service

VLE – Virtual Learning Platform

# CHAPTER 1 - INTRODUCTION

## 1.0 Introduction

This thesis is an investigation into the use of mobile technology to support professional learning within the Bachelor of Science (BSc) (Hons) Midwifery programme offered at the Higher Education Institute where the researcher is employed (Coventry University). The thesis is focused on the experiences of student midwives and the digital tools and technology that they choose to engage with during their programme of study. Qualitative in nature it covers the intricate layers and relationship that exists between student midwives and mobile learning within this digital age. The thesis takes an exploratory approach to research, which draws on ideas of crystallization (Ellingson 2009), taking the reader through an exploration of teaching and learning. The net result is a picture of the ways in which students engage with digital technologies for learning and the influence social connectivity has on transforming the way in which students engage in the real world around them.

## 1.1 The Study Design

The methodological design of this largely qualitative case study can be viewed as an interpretive or social constructivist one in that I am interested in the meaning that technology has for a group of people I have personal interaction with. The methodology is non-experimental and in keeping with case study research intends to combine both qualitative and quantitative methods nested together within a specific discipline area but reported in ways which would be relatable to the general field of technology enhanced learning. The subject of mobile learning is complex and a mixed methods research is used to capture the multi-dimensional nature of the phenomenon under study. In essence the aim is to capture how and why the students interact with the technology and what they see as the benefits and difficulties arising from that interaction.

Case study is not new to researching practice and 'case studies' are often used in midwifery practice to review actual events involving pregnant women, their care and outcomes. They are useful for considering what could or should have been done differently and showcase good clinical practice or identify where a service needs improvement. 'Case studies' are also used in midwifery education to develop students' critical thinking and clinical decision

making skills, these are usually presented as real-life scenarios with specific function and accompanied with question sets to generate discussion and make application to clinical practice. In social research the concept of a case study remains a subject for debate amongst authors (Baxter and Jack, 2008). Several definitions and concepts of what is understood to be case study exist but nearly all suggest that cases are bounded. The overall purpose of this qualitative case study is to improve our understanding of mobile learning and to explore how and why this complex phenomenon is influenced by the context in which it is situated. Case studies are often defined according to representativeness and in this case study student midwives represent the student body and mobile devices represent the choice of digital technology, hence the context in which it is situated.

The 'case' is the common denominator for case study research and as such could be people, phenomena, places, events and experience. For this thesis the case will be the experiences of student midwives using technology-enhanced learning. It is one chosen on ground of access, as I am Senior Lecturer in the Faculty in which the course is run but it is also purposive as I have a specific interest in the use of Apps for learning. In my study the boundedness is experiences of technology. Often the boundaries between the case and its context may not always be clear. The boundaries in my study are between the experiences of technology, this being the 'case', set in the context of learning on a midwifery educational programme with digital technologies. Whilst we can identify the specific instance that is the case, it is difficult to dissect it from its natural context without severing connections that are inherent to the nature of the case, and the case cannot be fully appreciated without some knowledge of its context. By reviewing the type of digital mobile devices the students own, what they see as the purpose of these devices and if and how they use them for learning is threaded through the findings and discussion. The case study has a focus on capturing the voices of student midwives. I used qualitative data collection methods, which included reviewing assessment documents from the Objective Summative Clinical Examination (OSCE), audio recordings and transcripts from in-depth interviews, audio recordings and transcripts from focus group sessions and structured online questionnaires. These methods were chosen as being the most appropriate to investigate the phenomenon of mobile learning in depth and seek a more panoramic view of the learning landscape with emerging technological tools. Justification of the research methodology, theoretical approach, and criteria for selecting study participants, recruitment methods and specific detail for each method will be outlined and explained in the methodology chapter.

The process reported in this thesis is an unusual one, responding to the opportunities and constraints that presented themselves over the course of the project.

## **1.2 Stepping Stones**

From my own success in designing and creating reusable learning objects (RLO) to creating Apps for mobile devices, it is my opinion that the use of bespoke apps for teaching and learning has a positive and unique impact on the way in which students learn. My own journey began when I became immersed in the world of technology working with the Centre for Interprofessional Learning (CIPeL) and the Serious Games Institute (SGI) at the University in which I am employed. I wanted to explore what new dimensions if any, the use of Apps could contribute to teaching and learning. My relationship with technology itself is one of interest as whilst I embrace new technologies I do so with cautious enthusiasm. I have a keen interest in how digital technologies alter the students' behavior and attitude to learning. Back in 2005 I accepted a secondment position to work on a project with a team of learning technologists in what was then known as the Centre for Interprofessional e-Learning (CIPeL). For several years this CIPeL was one of the Centres in Excellence for Teaching and Learning (CETL) in the United Kingdom (UK). This is where I gained a solid foundation in creating innovative e-learning materials for use by health and social care students. My own journey led me to morph from a classroom-based teacher to an e-facilitator using web based teaching platforms. Propelled into the world of technology I am often heralded as being the 'IT geek' by colleagues. However, this is not the case, as I do not make any claims to have qualifications in computing or informatics. I am however, inquisitive as to the role of emerging technologies, the use of computer applications to enhance my work and curious as to the impact of digital technologies on transformative learning.

As the new technologies have evolved so too has the relationship between educators and learners and the way in which individuals choose to learn. The diversification of the learner and the connected world that they live in demands changes in approaches to teaching and learning and inclusion of the pervasive tools that the learners have at their disposal. The combined technological advances in computer technology and telephony has resulted in a rapid increase in small, hand held devices such as a smartphone or tablet with sophisticated

mobile operating systems replacing the need for a desk based computer. However, the questions remains what opportunities do these digital technologies provide for the learner? Are they just an additional tool that digitally savvy students engage in as they are seen as being 'on trend'? I am interested in seeing how effective digital hand held devices can serve the learner to not only have access to specific learning materials when working away from the university campus but asking if there is a transformation in their learning by using them.

My CIPel secondment gave me the opportunity to create interactive media-rich resources with a range of reusable learning objects (RLO) to assist the teaching and learning of the clinical skills required to perform the Newborn Infant Physical Examination (NIPE). Several short bespoke video clips were created and loaded onto a suitable hand held device (iPod Touch) and an RLO illustrating normal and abnormal heart sounds in a neonate using an interactive stethoscope was developed and uploaded onto a virtual learning platform (VLE). This was seen at the time as being a fun and novel way of sharing material but I had not evaluated the learning that had taken place in depth. Following the success of this project two further projects were commissioned to explore how mobile technology could be used to provide flexible and cost-effective training support for midwives through the mechanism of Supervision (Brown, Clay, Lees 2010). The evaluation of each project was very positive and registered midwives welcomed this innovative and flexible approach as an educational update. At this time technology was seen as a 'must have' addition to traditional teaching resources and served the purpose to reduce the time taken for trained midwives to be released from clinical practice as the hand held devices were on loan and again a novel tool. The success of the projects was then built on in the use of mobile devices for midwives undertaking a Return to Midwifery Practice programme (RTMP). The overall aim of this project was to support the practitioner whose registration had lapsed to return to midwifery practice with competence and confidence. Candidates enrolling for the return to midwifery practice course between April 2010 and July 2010 were invited to use a mobile device either at home or in the clinical area to access the teaching materials and RLO's at a time convenient to them. The findings from the evaluation were consistent with previous studies (Clay 2011) and started to build a picture for me as to the usefulness of digital tools to convey teaching material in a convenient manner. This small feasibility study indicated that the use of a mobile device enhanced the mobility of learners and motility of learning (Brown, Lees and Clay 2010). In reality the RTMP students claimed that the mobile device benefited them, as they did not have the time to 'go online, learn how to use the university

systems and search for key documents'. In essence these students wanted to learn midwifery skills and update their midwifery knowledge, they did not have the motivation to engage in digital technology tools.

Opportunities were given to me at a time when the University was developing their own strategies for online learning and e-learning. I enjoyed immersing myself in the diverse world of technology but tussled with the complexities of why, how and with what benefit would the students engage in the use of digital technologies and mobile learning. Contained within the corporate strategy for teaching and learning at the University is the assumption that students entering higher education have a high degree of digital fluency and experience with innovative technologies. However, I started to question the level of proficiency that the students I encountered had with digital technologies. They often did not demonstrate digital fluency and the only experience they had with innovative technologies was using their mobile phones to shop, play games, connect with friends and family through social media and set an alarm or reminder.

Nonetheless the University is committed to exposing students to the latest technologies and will at every opportunity encourage them to engage with new technologies as part of their educational experience. Again this prompted me to observe which latest technologies the students were being exposed to, if and how they were engaging with 'new technologies'. I could see that the university had started to build an online infrastructure but this was focused on information systems, student records, enrolment and storage of grades. Glossy Apps were being developed, for example an interactive map for prospective students to use on university open days to navigate their way around campus. Proliferations of virtual learning platforms were being created and academic staff had to learn how to create eye-catching materials. Having spent several years engaged in developing online materials, delivering online modules, working closely with learning technologist and overcoming challenges of online management systems such as Blackboard and Moodle I still felt that the essence of responding to the needs of the modern learner through digital technologies was not fully understood. If it were just having the ability to navigate web pages, access a virtual learning platform for learning materials then learning would soon be revolutionized and universities replaced by a virtual institution.

In order to promote e-learning in my taught classroom sessions I would invite students to connect to the Internet or look up a resource online and for most part they would admit to not knowing how to use their mobile device or mobile phone to connect. I started to include time in my lectures to teach the students how to use their mobile devices and increase their opportunity to access educational materials. This soon extended to bite sized sessions on using the VLE to access their modules and how to navigate around the university virtual world. It is essential that the modern student attending any level of educational institute and especially university becomes familiar and has an online presence. Classroom timetables are all online; coursework submission is largely through online systems; communication is essentially online. I am not sure how any student could survive at university today without having some level of digital knowledge and skill.

This reflection led me to question how digital teaching and learning technologies actually prepared the student midwife with the digital skills necessary to transform the way, in which they will engage, work and learn in the future. They are being prepared with the essential clinical skills required to work in their chosen health care profession but they also need to be prepared and digitally fluent to succeed in their workplace. I started to ponder, how do learners respond to learning with new technology differentiated by for example demographic factors for example age and gender, or orientation to learning such as deep or surface approaches to learning? In trying to answer this question an obvious place to start was to find out just what exactly students did with the technology and my first question to address had to be a descriptive one, *what mobile devices do the learners have and what do they use them for?* Later as I had gained an idea of just how central technology was to students' lives and learning my focus moved further away from mobile learning being driven by the device to being driven by the user of the device, this study more and more looked at how and why students interact with the technology and what they see as the benefits and difficulties arising from that interaction. My next research question then was a more evaluative question, *what do learners perceive to be the benefits and challenges of mobile learning?*

My research was essentially pragmatic and moved in the direction that my involvement with the students took me. Indeed my interest in the use of technology for teaching and learning was further enhanced with a successful bid to develop an Application (App) for an iPhone/iPod touch and later iPad. Working with technologists at the Serious Games Institute at the local University between 2011-2013 I designed a unique suite of four Apps

that went to market on the Apple Store. One of these Apps is the Shoulder Dystocia App (SDA) that I will explain within the subsequent section. This development prompted my keen interest to investigate how a cohort of second year student midwives used and learnt with technology. This was a cohort that I taught. More specifically I wanted to, through a case study approach to capture their engagement with a digital Application (App) to learn and perform the clinical skills when managing an obstetric emergency. The question driving this forward evolved as, *does bespoke learning material have a place in mLearning?* I was interested in making comparisons and exploring variance in the grades attained after changing the way some of the content of a module was conveyed to the student. This created a tension in that my research was looking both at the general use of mobile technology and a particular App but in the end this dual focus strengthened the thesis as I was able to report on both formal and informal learning.

Having identified three questions I was conscious of a need to wrap them around a more holistic framing of the study and eventually I could see that my unifying concern was captured by the overarching question - *how do learners make use of mobile technology and with what consequences?* Although there were several amendments to the way the questions were formed during the study and these changes could be a chapter in themselves, the research questions need to be expressed with clarity at the start of the thesis. Thus my overarching question and the sub questions are as indicated:

*Key question*

*How do learners make use of mobile technology and with what consequences?*

*Sub-questions*

- 1. What mobile devices do the learners have and what do they use them for?*
- 2. What do learners perceive to be the benefits and challenges of mobile learning?*
- 3. Does bespoke learning material have a place in mLearning?*

These are the questions that are addressed in the findings and discussion. The findings are not discussed in this introduction but I can confirm that Apps cannot replace the simulated practice of a 'skills drill' but they do serve to complement face-to-face learning. If and when health care professionals and students engage in using or accessing digital and instructive Apps they should be used with caution, as they cannot replace and do not remove the need for drawing upon professional judgment in determining the management of an episode of care.

## **1.3 Professional Learning**

In order to understand the setting of the thesis this next section explains the development of professional learning and how students on a Bachelor of Science with Honors (BSc Hons) Degree in Midwifery have the opportunity to study for a Degree level award and eligibility to register as a professional midwife with the recognised professional regulatory body of the Nursing and Midwifery Council (NMC). The context then is a programme of professional learning leading to registration with a regulatory professional body, and of relevance to other programmes in the health and life sciences field including Nursing, Physiotherapy, Occupational Therapy and other similar professions.

The minimum award for a pre-registration midwifery programme is a Bachelor's Degree and following completion of the programme eligible candidates have five years to register their award with the NMC. Education institutions and practice learning partners work within the Standards set out in the framework for nursing and midwifery education (NMC 2009) to develop innovative programmes of study for nurses and midwives ensuring that by the end of their training and at the point of registration with the awarding body that they can perform and deliver high quality healthcare. This is a continual process throughout their careers whilst they hold a license to practice in the profession they have registered. Fundamentally, by registering with the NMC an annual financial membership/ license fee is paid and every three years following qualification the process of revalidation occurs, where in order to retain professional registration each individual has to provide evidence of learning beyond registration.

### **1.3.1 The course**

Midwifery education moved from hospitals to universities in 1986 to gain academic recognition. During the last twenty years nursing and midwifery qualifications have seen significant changes, moving from certificate level training to becoming diploma level education then degree level education and now at master degree level education.

There is no longer a minimum age restriction for an individual entering a pre-registration midwifery programme but education providers have to abide by the rule that the individual has to have attained ten years of general education (NMC, 2009) and comply with the

Health and Safety at Work Act (2004) in respect to the manner in which a young person, in this context any person under the age of 18 years, can be deployed. Midwifery is a highly sensitive area by the nature of the work and young people entering the programme of study have to be protected for exposure to sensitive placement areas. By virtue of the meaning of the word midwife, 'with woman' specialist care is usually delivered by women.

The BSc (Hons) Midwifery course is a full time programme over three years, equivalent to 45 weeks a year, a total of 4,600 hours over three years. The midwifery programme at the HEI in which I work attracts a large number of interested individuals with approximately 850 applicants on UCAS for 38 places. There is one intake per year and this is typically in the autumn term, which is September, and applicants must attain three A level qualifications grades A, B and B to include a science, or a BTEC award in Health and Social Care with at least two Distinctions and one Merit to satisfy the entry requirements. The current fee per year of study is £9,300. Throughout the three years students will study a wide range of subjects, including anatomy and physiology, pharmacology, research methods, social determinants of health and wellbeing, complexities in childbearing, international perspectives in midwifery, legal and ethical issues in midwifery. There are various unique selling points that each HEI will offer and for the one that I work, the integration of studying theoretical subjects and gaining clinical experience through a clinical placement from week eight of the programme is one that is valued. The Nursing and Midwifery Council (NMC) as the professional body responsible for reviewing and maintaining standards for midwifery education and practice, state that the Standards for pre-registration midwifery education (NMC, 2009) must demonstrate a variety of teaching and learning strategies, which includes simulation. In order to acquire the knowledge and skills for normal and complex childbirth students have dedicated time working in a bespoke simulation area located on the university campus. This provides them with opportunity to learn and rehearse a range of clinical skills from communication, cardiopulmonary resuscitation, and newborn examination, emergency drills to high fidelity intensive care skills.

In the United Kingdom (UK) each university where pre-registration midwifery education is taught a Lead Midwife for Education (LME) is installed to promote the quality assurance of midwifery education programmes and consistency in the education of midwives and midwife teachers. The LME role is unique and is integral to strategic liaison with internal

and external agencies inputting at operational levels ensuring that the NMC's requirements for due regard are met and maintained (NMC 2009, NMC 2019d). Standards for pre-registration midwifery education require that the student midwife undertake no less than 50 per cent of the available curriculum hours in clinical practice and no less than 40 per cent in theory (NMC, 2009). As the maternity service provides 24-hour care, seven days a week student midwives are expected to gain experience across a range of working hours including weekends and night shifts during the course. All students have supernumerary status during clinical practice. Throughout the programme specific clinical skills have to be achieved and students carry a clinical logbook, which contains cumulative information about their achievement of midwifery skills and ability to practise safely and effectively. Translated into a working week for first year students this means three days of theory with attendance at taught modules on specified days of which simulation in the clinical skills laboratory will be a feature and two days of clinical practice leaving two rest days. As the students' progress into their second and third year the 'theory' day's decrease to two and then one day affording more time and exposure to clinical practice, for example, three days increasing to four days and five days as they advance towards competence for registration and award. This division in hours places the student in a different learning environment and setting from the midwifery lecturer for at least 50 per cent of the course hence, an opportunity to access the virtual learning environment (module web platforms) and other digital technologies. This is an area that I have identified for improvement and development within the current midwifery programme and where mobile learning could enhance students learning once I have identified through my study how students make use of mobile technology for learning.

The university in which I work and the university in which the study took place is a group across three regional sites with over 34,000 students. It has gained national accreditation for being voted modern university of the year for three consecutive years (2014-2016), retained its place as being the country's top modern university for seven consecutive years (2013-2019), has the accolade of being 'University of the Year for student Experience (2019) and awarded Gold for outstanding Teaching and Learning. As a member of academic staff in the Faculty of Health and Life Sciences (HLS) I am proud to share that the midwifery students consistently report 99% - 100% satisfaction with the quality of teaching on their course.

### 1.3.2 Professional Midwife

The midwife is recognised as the lead professional responsible for the care of a woman during her pregnancy, throughout her labour and the early postnatal period following birth (NMC, 2009, NMC 2017). Surveillance of the unborn and newborn baby is also included in the scope of the midwives professional practice, as is being conversant with the markers of good neonatal health (Royal College of Midwives, (RCM), 2014). Midwives are specialists in normal pregnancy and birth and their role is diverse with the majority of midwives working across a range of health care settings; for example, in the maternity unit of a general hospital, a smaller stand-alone maternity unit, birth centre, and community (NHS, 2016). Therefore, it is essential that programmes of education provide the student midwife with the appropriate skills and knowledge to safely perform the duties expected of a midwife and assume fully responsibility and accountability for their practice at the point of registration. For this reason all educational programmes for midwifery across the United Kingdom (UK) have joint validation by the NMC as the professional regulatory body and the Higher Education Institute (HEI) to ensure that they meet all of the required standards to be eligible for registration and Degree award (NMC, 2009).

In the nineteen years that I have worked in midwifery education I have had the privilege of being involved in training approximately seven hundred student midwives all of which have been female with the exception of one male. According to the NMC at the end of March 2019 only 0.3% of the 36,808 registered midwives in the UK were male (106 male midwives), reinforcing that the midwifery profession is primarily a workforce dominated by women. During the past years there has been a steady and stable age profile of students entering their training with approximately 70% being under the age of 30 years, 29% between the ages 31-50 years and 1% being over the age of 51 year. This is representative of the age profile of people joining the NMC register for the first time between the years 2014 – 2018 (NMC, 2019). Since the removal of the bursary and introduction of tuition fees, Universities and Colleges Admissions Service (UCAS) report that there has been at least a 35% decline in applicants to midwifery over the age of 21 years. The age profile in the cohort of student midwives in my study mirror the expected age range as 30% were aged between 19-20, 60% were aged between 21-30 and 10% aged between 31-40 years (UCAS, 2018).

It became increasingly evident that nurses and midwives who do not hold a degree level of education can find themselves disadvantaged in this new professional landscape (Lord, 2002). All nurse and midwifery pre-registration education is now at degree level and the boundaries are being raised again to develop a work force of clinical nurse specialists, clinical nurse consultants, professors in specialisms and general education (NMC, 2009). However, it has taken time and several years of re-adjustment for the workforce to become a predominately degree level profession. Professional post registration courses continue as opportunities for health care professionals to gain graduate standing and meet the revalidation requirements of the NMC. Revalidation is a process that all nurses and midwives in the United Kingdom need to follow to maintain their registration with the NMC and ensure that they continue to be safe and effective practitioners (NMC, 2015). Contemporary nurses and midwives are required to be professionally accountable, have up to date knowledge, education and skills to deliver care that is evidence-based and best practice. However, with the competing demands of combining shift work with family commitments it is increasingly difficult to be released and find the 'space and time' to undertake continuing professional education (CPD).

It has long been recognised that for health care professionals to embrace the essence of lifelong learning, education needs to be accessible, affordable and flexible. Historically this has been undertaken under the guise of mandatory training and updates, often a few hours stolen from the clinical shift and additional reading of journal articles at home or in the workplace. To compensate for this and provide a platform for CPD the use of emerging technologies is now being embraced by institutional managers. In order to understand how the use of these technologies can make a difference for pre-registration learning, post-registration learning and CPD in nursing and midwifery education we need to examine some important technological developments within this field and how they can be used to their best potential (O'Connor and Andrews, 2018).

Throughout this thesis the term midwife will be primarily used in conjunction with the participants of the study. The umbrella term nurse and nursing will be used within the literature review as the majority of literature in this field is focused on nurse education but is transferable to the midwifery landscape.

## 1.4 The Structure of the thesis

The thesis has an unusual structure reflecting the iterative and exploratory nature of the investigation. Chapter one, as the introduction, sets the focus of the study and provides an overview of the research design, setting and context in which the study has been undertaken.

Chapter two reviews a range of theoretical literature surrounds mobile learning. It draws on mobile learning theories and attempts to clarify how the concept of a flexible pedagogical approach can empower students to manage their own learning in a variety of contexts. Models for framing mobile learning are introduced and considerations given to the social aspect of the learner. In respect of enabling individuals to learn and make best use of opportunities and technologies available it includes a discussion of tensions and challenges faced in mobile learning in midwifery education. It concludes with consideration to the value of mobile learning upon learning and teaching.

Chapter three explains the methodology and study design of the thesis. It explains both the qualitative and quantitative research design methods used in the study. The synergy between the research question and research methods are shared and their influence on the methods employed. Ethical clearance and ethical considerations are highlighted with attention on the rigor, validity and reliability of the research. The participants are introduced as a cohort of student undertaking a BSc (Hons) Midwifery degree and I give details of their profile as a community of learners.

Chapter four reports the findings from the data obtained using tables, figures, charts and narrative. The survey, face-to-face interviews and small group work answer questions about the student's experience, attitude and perspective of mobile learning. The data presented from the simulated OSCE assessment aids to situate the learner as to the use of a specially designed Application (App) for the management of an obstetric emergency before and following assessment. Findings contribute to the discourse and tension that surround the value of mobile learning within midwifery education.

Chapter five provides commentary and discussion about the findings from the data and reflects each in relationship to the research questions. It demonstrates how the findings of

this research contribute to the literature and captures the essence of mobile learning from the perspective of midwifery education through the voice of the students.

The final chapter provides a summary of the thesis, the strengths of the study and addresses perceived limitations. Opportunity is taken to re-cap the research questions and present a summary of the main findings and key issues. The use of a bespoke, innovative Application for mobile learning is revisited and its contribution to enhancing how student midwives engage and become active participants in their own learning. The concept of mobile learning is demystified as clarity on the pedagogy associated with digital technologies is presented. Conclusions are offered as to how learners make use of digital technology whilst being cautious of perceived consequences to their learning.

### **1.5 Chapter Summary**

This chapter has introduced the thesis and explained my interest and experience in the field of midwifery education. It has described the prevalence of mobile technology in students' lives and asked whether technology can assist professional learning. The subject of mobile learning is complex and a mixed methods research is used to capture the multi-dimensional nature of the phenomenon under study. This bounded case study aims to capture the degree to which students use mobile technology; how and why they do so; and what they see as the benefits and difficulties arising from that engagement. The overarching question of my thesis is *how do learners make use of mobile technology and with what consequences?*

## 2.0 CHAPTER 2 – LITERATURE REVIEW

### 2.0 Introduction

This chapter sets out to provide a review of the literature and the key concepts within the thesis which include: technology enhanced learning; progression towards blended learning; evolution of mobile learning (mLearning); types of technology associated with mLearning; pedagogies to support mLearning; features of mLearning and how mLearning is situated in the context of midwifery undergraduate professional education and professional development. Section 2.1 details how the literature and data were accessed and only literature that contributed to the understanding of the phenomenon was selected for inclusion. Section 2.2 focuses on exploring the concept of mobile learning whilst the use of technology in teaching and learning are addressed in section 2.3. Section 2.4 considers pedagogical approaches to support mobile learning while section 2.5 focuses on the use of the phenomenon mobile learning and its context in professional nursing and midwifery education. A summary of the chapter is presented in Section 2.6.

### 2.1 Accessing and selecting the literature and data

Due to my engagement with the field of mobile learning over several years I had read some of the classic accounts of M learning, including Sharples (2002) and Kukulska-Hulme et al (2009) and Traxler (2009). I was also aware of some of the particular frameworks which sought to model learning (e.g. Sharples, Taylor and Vavoula, (2005) and Koole (2009). Thus my review offers a narrative around M learning and around the use of technology in learning. I also have included commentaries on midwife education (NMC, 2009). These various sources are described and reflected upon in the review that follows. An additional and important part of the review, however, was to search for journal articles with findings, in the form of both quantitative and qualitative data, on the use of Mlearning in the context of nursing and midwifery. In the first instance I selected the databases to nursing and midwifery research.

When conducting a literature review in a systematic manner, framing the review question is an essential step (Briggs, 2017). Therefore, my research question and inquiry around the

phenomenon were formed first by using the FINER criteria (Hulley et al, 2007). In order to develop specific research sub-questions the PICO (Sackett et al, 1997) format was applied. This format considers the population (P) of interest, the intervention (I) being studies, the comparison (C) group (or what the intervention is being compared with) and the outcome (O) of interest). Variations of PICO are widely used in nursing, midwifery and social healthcare research (Polit and Totano-Beck, 2009). The elements formulated around the PICO were: Population (student midwives), Intervention (mobile technologies and smartphone devices), Comparison (theoretical classroom learning) and Outcome (enhanced learning and opportunities with mobile technology).

Table 1 illustrates the use of the FINER model for developing the research questions (Hulley et al, 2007).

**Table 1 - FINER model for mixed methods research question and search strategy**

<b>FINER criteria</b>	<b>Content</b>
<b>F (Feasibility)</b>	Sufficient resources in terms of funding for studies, time, study design and recruitment for study sample.
<b>I (Interesting)</b>	Motivation to remain interested in the topic and make it interesting.
<b>N (Novel)</b>	Literature search to reveal new findings and/or extension of previous findings from experts.
<b>E (Ethical)</b>	Follow ethical guidelines and approval from Higher Education Institute.
<b>R (Relevant)</b>	Influence on teaching and learning, remain focused on strategies for technology-enhanced learning.

I then moved to think about the key words and how appropriate they were for capturing the essence of the phenomenon (Aveyard, 2010). In doing so the following key search terms were included: mobile learning; m-learning; technology; digital e-learning; technology enhanced learning; digital natives in nursing and midwifery education; emerging pedagogy, learning theories. The words were used in various combinations to locate relevant sources and mapped against threads as in the table below. As the focus of this literature review is on mobile technology, keywords such as eHealth, ICT and health informatics were

excluded, as they would yield too many irrelevant articles. An overwhelming amount of literature was identified when the literature search focused on emerging and digital technology for professional nursing education so I refined the combinations for searching, considered the use of three key threads: technology; professional; learning and added as limiters (Table 2).

**Table 2 - Mapping keywords**

<b>Thread</b>	<b>Key words</b>
<b>Technology</b>	Mobile learning; m-Learning; mobile technology; emerging technology; e-learning, Technology tools; technology enhanced learning; hand held devices; digital capabilities; digital literacy; digital fluency
<b>Professional</b>	Midwife education; nurse education; health and/or care professional; digital strategy; continuous professional development CPD*; professional education
<b>Learning</b>	Flexible pedagogy; new pedagogy; learning theories; undergraduate; midwife and nurse education

Inclusion and exclusion criteria were applied enabling me to address relevant literature in relation to my specific phenomenon. Table 3 illustrates the set inclusion and exclusion used.

**Table 3 - Inclusion and exclusion criteria for literature search**

<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>
Primary research relating to mobile technology and technology and mobile devices in nursing and midwifery education. English language only Published literature only Year 2000 onwards Terms 'nurse' and 'midwife' Higher Education only	Avoid secondary data related to the phenomenon Exclude keywords such as e-health, ICT and health informatics Not English language Unpublished research Pre-2000 Not Higher Education

Databases for searching have become increasingly sophisticated with search facilities designed to make searching as easy and simple as possible. Structured searches were conducted on five electronic subject specific databases for this review and were supported by the Faculty librarian at Coventry University and the Royal College of Nursing. Using the library's search tool Locate the searches were undertaken through CINAHL, a recognised medical and nursing database and extended to Cochrane; PubMed; and ProQuest Central. Key resources were also obtained through Locate by focusing on flexible pedagogies and emerging technology-enhanced learning. The search attempted to capture quantitative and qualitative research papers and other educational uses of mobile technologies. Once full text articles were obtained the use of forward and backward chaining were employed.

Two methods of searching each database were used; one used a set of controlled keyword search terms or Subject headings and the other keywords within each bibliographic record. Subject searching through MeSH in the Cochrane Library and Pubmed databases had the advantage of using subheadings to be more specific. Keyword and free text searching was a useful tool for searching phrases such as “mobile technology”, “technology enhanced learning”, “emerging technology in education”. As these terms produced copious amounts of articles with the key words and synonyms, the searches were refined by truncation (searching substituting a symbol at the end of the search word) and the Boolean Operators using ‘And, Or, NOT’, thus allowing a combination or exclusion of terms within the search. From the results more headings that appeared relevant were then added to broaden the search and the methods were replicated across each search engine.

The following tables (Table 4a and Table 4b) show an overview of search terms and results in CINAHL. In table 4a a Matrix Method (MM) was the choice of design to initiate the search relating to mLearning. This yielded an overwhelming number of articles that contained words that were later excluded as they did not focus on the topic under review as they were included in a different context within the literature sourced. Table 4b focused on combining key words with mobile technology. Using the search ID number (#) I attempted to reduce the number of hits/results. For example the terms from S1# and S2# when combined nearly doubled the results. Additional limiters were applied such as;

year of publication and the truncation addendum denoted by the symbol \* before keywords.

**Table 4a - CINAHL 1 - key search terms and results (mLearning)**

<b>Search ID#</b>	<b>Search Terms</b>	<b>Results</b>
S10	S4 and S9	192
S9	S7 and S8	11,429
S8	Emerg* or digital* or online	210,892
S7	Technolog*	87,730
S6	Mobile learning or mlearning or m-learning	45
S5	Connected learn*	4
S4	S1 or S2 limited to 1998 and onwards only	17,747
S3	S1 or S2	20,967
S2	(MM “Professional Development+”)	9,491
S1	(MM “Education, Continuing+”) OR “post registration”	12,481

In a similar format a further search on mobile technology and nurse education in CINAHL was undertaken and presented in Table 4b.

**Table 4b – CINAHL 2 - key search terms and results (mobile technology)**

<b>Search ID#</b>	<b>Search Terms</b>	<b>Results</b>
S13	S3 and S12	73
S12	Mobile device*	616
S11	S5 and S10	5
S10	Pedagog*	2,678
S9	S5 and S8	32
S8	Student attitude*	13,899
S7	S5 and S6 LIMITED TO 2017 and ONWARDS ONLY	27
S6	(MM “Education, Nursing+”)	2,794
S5	Mobile applications or apps or mobile apps or smartphone	6,030
S4	S2 and S3 LIMITED TO 2010 and ONWARDS	37
S3	Nursing education OR learning OR pedagog*	45,899
S2	“mobile technology”	300

The results from both tables were reviewed for relevance and the number of results yielded by combining search terms identified as #S4 and #S5 equaled 192. These results were added to the hits yielded from the second CINAHL search #3 and #12 giving an additional 73.

Scanning the titles of the identified literature I was able to exclude the majority of papers, as they were not relevant to the focus of professional learning and mobile technology. The excluded papers included the words 'mobile' or 'technology' or 'teaching' or a combination of the words but were focused on computer technology, teaching mathematics, use of mobile technologies in primary and secondary school settings, using technology for 'tele-medicine' and engaging learners in classroom based interactions.

Of the initial selection the abstracts for 265 research papers were then reviewed for eligibility to the focus of the study and setting and, at this stage, a further 230 papers were excluded. Several articles and systematic reviews relating to defining mobile learning, understanding the concept of flexible mobile technologies were included to form the background and assist in the setting of the landscape within the study. This resulted in approximately 18 papers being selected for inclusion in this review focusing on technology, learning and pedagogical approaches to mLearning. Further to this, 14 papers were selected for their relevance in the area of defining and outlining the developments associated with the term mLearning. From the copious amount of 'hits' related to the phenomenon in relation to nurse and midwife education 26 papers containing a variety of studies were included for relevance to the use of mlearning in context with professional nursing and midwifery education.

The Critical Appraisal Skills Programme (CASP, 2018) checklist was used when appraising qualitative studies as this aided the reduction in the number of articles and studies identified by the database. At each appropriate point in time, articles were read thoroughly and key ideas were highlighted and arranged. Littman's (2006) data analysis method was used to help reduce the large amount of data and uncover themes and trends in the literature through a system of Coding, Categories and Concepts. The Code indicated the label attached to a phrase, for example 'm-learning' for each mention of technology used for learning. Following this similar codes were merged to get a broader sense of the data and categories used to reduce the number of different pieces of data. Finally, each category was critically reviewed and similar groups were merged which helped to identify the

emerging themes; mLearning, pedagogical approaches to mLearning and mLearning in professional nurse and midwife education.

During the time frame of the study and undertaking of the first literature search time had elapsed (due to personal circumstances) which resulted in two periods of interruption from the programme, once in 2016 and again in 2018. At each point when the study recommenced short literature searches were repeated using the same terms and limiters. This provided the opportunity and inspiration to complete the writing up stages of the study. Figure 1 is a flow diagram of the search process and results obtained using the databases and search strategy.

**Figure 1 A flow diagram of the search process and results obtained.**

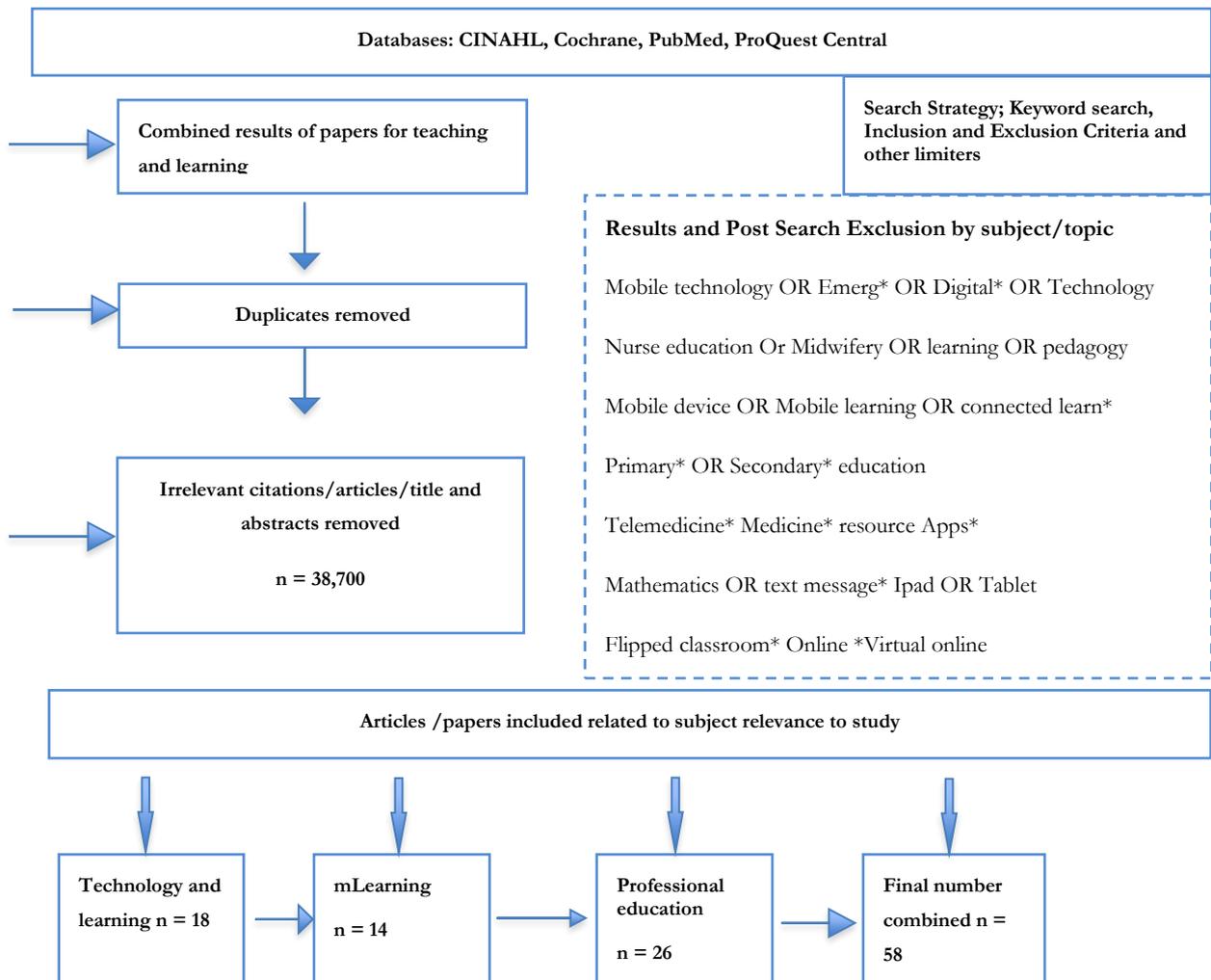


Table 5 is a sample of research articles included in the review from both searches relating to the phenomenon, nursing and midwifery education and presented in chronological order with the earliest publication first.

**Table 5 – Sample of included literature for review**

Title and Citation	Author and Year
Observations in classrooms using a network of handheld devices. (2003) <i>Journal of Computer Assisted Learning</i> , 19 (3): 298-307	Davis, S.
Using short message service to encourage interactivity in the classroom (2006) <i>Computers and Education</i> , 46 (3): 280-293	Markett, L., Sanchez, A., Weber, S., Tangney, B.
The perception of learning and satisfaction of nurses in the online environment (2009) <i>Journal for Nurses in Staff Development</i> , 25(1): 8-13	Gerkin, K.,L., Taylor, T., H., Weatherby, F., M.
Instructional Design Variations in Internet-Based Learning for Health Professions Education: A Systematic Review and Meta-Analysis (2010) <i>Journal of the Association of American Medical Colleges</i> 85: 909-922	Cook, A., Levinson, D., Garside, A., Dupras, S., Erwin, D., Erwin, J., Montori, P., Montori, V.
Can a lean medium enhance large-group communication? Examining the impact of interactive mobile learning (2010) <i>Journal of the American Society for Information Science &amp; Technology</i> , 61(10): 2122-217	Du, H., Hao, J., Kwok, R., Wagner, C.
Educational technology pedagogy: A looseness of fit between learning theories and pedagogy <i>Education as Change</i> , 14 (2): 273-287,	Jaffer S (2010)
The Connected Learning Model for disseminating evidence-based care practices in clinical settings (2010) <i>Nurse Education in Practice</i> , 10(4): 243-248	Leken, D., Hendrix, C.C., McConnell, E.S., White, H.
Educational strategies in the NICU. Podcasts, webcasts, Sims and more: new and innovative ways for nurses to learn. (2010) <i>Neonatal Network</i> , 29(6): 396-399	Pilcher, J., and Bedford, L.
Cooperative m-learning with nurse practitioner student. (2010) <i>Nursing Education Perspectives</i> (National League for Nursing), 31(2):109-112	Wyatt, T.H., Krauskopf, P.B., Gaylor, N.M., Ward, A., Huffstutler-Hawkins, S., Goodwin, L.
Introducing Personal Digital Assistants to Enhance Nursing Education in Undergraduate and Graduate Nursing Programs (2011) <i>Journal of Nursing Education</i> , 50(2): 115-118	Cibulka, N., J., Crane-Wider, L.

Exploring the use of mobile technologies for the acquisition of clinical skills (2011) <i>Nurse Education Today</i> , 31(6): 582-586	Clay, C.
Podcasting as an instructional supplement to online learning: a pilot study (2011) <i>Computers, Informatics, Nursing</i> , 29(3): 144 -148	Stiffler, D., Stoten, S., Culle, D.
Smartphones in nursing education (2011) <i>Computers, Informatics, Nursing</i> , 29(8): 449-454	Phillippi, J., Wyatt, TH.
Students prescribing emergency drug infusions utilizing smartphones out perform consultants using BNFCs, (2011) <i>Resuscitation</i> , 82: 1424-1427	Flannigan, C., McAloon, J.
Exploring the opinions of registered nurses working in a clinical transfusion environment on the contribution of e-learning to personal learning and clinical practice: Results of a small scale educational research study. (2013) <i>Nurse Education in Practice</i> , 13(3), 221-227	Cottrell, S., and Donaldson, J.
Nursing students' experience of using a personal digital assistant (PDA) in clinical practice—An intervention study (2013) <i>Nurse Education Today</i> , 33, 1246-1251	Johansson P E, Petersson, G.I., and Nilsson, G.C.
Smartphone Apps for Cardiopulmonary Resuscitation Training and Real Incident Support: A Mixed-Methods evaluation study (2014) <i>Journal Medical internet Research</i> 16 (3), 89	Kalz, M., Lensen, N., Felzen, M., Rossaint, R., Tabucenca, B., Specht, M., Skorning, M.
Evaluation of the use of iPod Touch drug guide by nursing students (2014) <i>Singapore Nursing Journal</i> , 41(1):10-14.	Koh, G.M., Phang, C.H., Tang, L.S., How, AL, Chio MS & Soo, T.
Just-in-time research: a call to arms for research into mobile technologies in higher education (2015) <i>Research in Learning Technology</i> 23: 25653	Byrne-Davis, L., Dexter, H., Hart, J., Cappelli, T., Byrne, G., Sampson, I., Mooney, J., Lunsden, C.
Learning the ABCs of pregnancy and newborn care through mobile technology. (2015) <i>Global Health Action</i> , 8: 29340	Entsieh, A., A., Emmelin, M., Pettersson, K.
Promoting Nursing Students' Clinical Learning Through a Mobile e-Portfolio (2016) 34(11): 535-543	Chin-Yuan, L., Cheng- Chih, W.
Mobile-Based Video Learning Outcomes in Clinical Nursing Skill Education (2016) <i>Computer, Informatics, Nursing</i> , 34, 25-33	Lee, N.J., Chae, S.M., Kim, H., Lee, J., H., Min, H., J., Park, D., E.
Nursing students' perceptions of using smartphones in the community practicum: A qualitative study (2017) <i>Nurse Education Today</i> , 53, 1-6	Beauregard, P., Arnaert, A., Ponzoni, N.
Online professional development for digitally differentiated nurses: An action research perspective (2017) <i>Nurse Education in Practice</i> , 22, 55-62	Green, J.K., and Huntington, A.D.

Exploring the impacts of interactions, social presence and emotional engagement on active collaborative learning in a social web-based environment. <i>Computers and Education</i> 123, 41-52	Molinillo S, Aguilar-Illescas R, Anaya-Sanchez R and Vallespin-Aran M (2017)
Smartphones and mobile applications (apps) in clinical nursing education: A student perspective (2018) <i>Nurse Education Today</i> , 69:172-178	O'Connor, S., Andrews, T.

## 2.2 Exploring mobile learning (mLearning)

Technology has always been inherent in teaching practices in one way or another, use of an overhead projector, handouts, blackboards, and an abacus may no longer be impressive but were key stepping stones and part of the journey. The advancement of the personal computer at the cusp of the 1980's and the Internet in the 1990's (Leiner et al, 1997) marked a key turning point and placed computer technology as the most important and powerful tool for modern learners. Since then technology has grown at a rapid pace but education and social political structures seem to have been slow in keeping up. Nearly all higher education institutes in the United Kingdom (UK) are engaged in e-learning and mLearning in a variety of ways, ranging from the use of virtual learning platforms, mobile technology and information technology systems for students incorporating: online enrolment; online timetabling; Applications (Apps) for study and learning; bite-sized online courses. Although this review and thesis is not focused on e-learning it is the starting place, as it is fundamental and integral to the concept of mobile learning and how using hand held devices gives access to online materials. The greatest benefits of electronic learning remain unchanged since its inception and are now embedded within education and the modern world of education. It is often associated with the terms: 'online'; 'distance'; 'hybrid'; mobile and 'blended' learning and as such is cause for much debate (HEA, 2013).

Traditionally e-learning has been described as learning enabled by the assistance of electronic technologies to deliver a course or programme completely online (Traxler, 2005). On the surface, this seems to fit with the device characteristics but as such hand held devices changed in the fast pace world of phone technology definitions reflected the changes made. With more reliable Internet access mobile phone companies have been constantly and progressively improving the specification amendments of hand held

devices and this plays an integral part in the changing definitions surrounding the concept of mobile learning. The crux of the debate is the understanding of how e-learning tethers the learners to a desktop computer or laptop, confining them to one location. The technical attributes of handheld devices may have contributed to the tension that arose amongst researchers in the literature, with some researchers viewing mLearning as a form of Electronic-Learning (e-learning).

Sharples (2002) initially referred to mobile learning (mLearning) as learning that happened without being limited to a fixed location, for example away from the normal learning environment with a mobile device. A suggestion later refined this phenomenon, was quite simply, learning on small portable devices (Keagen 2005). The early literature and commentators focused on the technology of a hand held mobile device as the tool to aid learning. It was understood by Traxler (2005) to be any learning or educational provision reliant predominantly on handheld technologies or palm held devices. Confusion as to the discrete differences remained as Internet dependent devices and access to the online virtual learning environments were reported as adding value and uniqueness to the concept of mLearning through e-learning (Sharples, Taylor & Vavoula, 2007).

As authors in this field developed their knowledge of mLearning they turned their attention towards the positive characteristics associated with the technology. Researchers suggested that mLearning offered the learner flexibility in the place for where any learning activity could take place. Certain characteristics are associated with mLearning and much of the early literature focused on the usability, function and technical features of the electronic device. These affordances were claimed to be: 'immediacy; convenience' (Kynaelahti, 2003); 'access' (Parsons and Ryu, 2006) to learning materials and flexibility of having access to learning materials 'just-in-time' (Killi and Morrison, 2015). The 'mobility' (Sharples et al, 2009) and 'ubiquity' (Kukulaska-Hulme et al, 2009) of the technology evolved to reframe the concept of mLearnig with emphasis being driven by the device rather than the learning (Attewell, Savill-Smith and Douch 2009).

Definitions of mLearning evolved to become more sophisticated, suggesting that 'mobility' was central to mLearning (Winters, 2006). Kukulaska-Hulme (2009) reinforced that mLearning reflected the physical mobility of where the device was being used to access digital learning resources regardless of space, time and place. However, some

researchers continued to argue that mLearning has always meant, ‘mobile e-learning’ (Traxler, 2009). Broad definitions revolve around the use of electronic devices such as computers, tablets or smartphones to deliver educational content to learners (Kukulska-Hulme et al, 2009), similar to those features related to e-learning.

As the popularity of digital technologies gained momentum so did an optimistic view of mLearning. This was mainly generated by handheld devices becoming smaller, faster and cheaper and at the same time as connectivity to the Internet became more reliable and effective communication tool (Sharples, 2002, BECTA, 2006). As momentum gathered around the popular use of technologies for learning, key authors adapted their own perceptions and revised their definitions of the phenomenon. Sharples (2007) expanded his definitions to include the process of communication across multiple contexts with people using interactive technologies. At what seems to have been the height of perfusion for this phenomenon, mobile learning agencies, mobile learning networks and reviews rapidly increased and the literature became saturated. Claims were made that mLearning extended to learning that takes place anytime, anywhere with the help of a mobile device such as a mobile phone (Kadirire, 2009). Commentators on this phenomenon attempted to point out that mLearning meant more than the use of a device to access material and communicate with others (Sharples, 2009). Simultaneously, the use of handheld devices and smartphones surged in popularity, leading to further re-adjustment in definitions, which remained focused on technology: ubiquitous handheld hardware; telephony and wireless capabilities (MoLNet, 2010).

Suggestions of how mobile technologies reach and support learning were made but with limited explanation or understanding of how this occurred. A broad definition to explain the concept of mLearning derived from MoLeNET (2010), as the harnessing of technology in order to modernise aspects of teaching, learning and training. Commentators on this phenomenon attempt to point out that mLearning have always been more than the use of a device to access material and communicate with others (Sharples, 2009). Table 6 captures the features attributed to mLearning between 2005–2015.

**Table 6 - Early features associated with mLearning**

Early Characteristic	Author	Year
Mobility	Sharples	2005, 2009
Mobility	Winters	2009
Ubiquity	Kukulska-Hulme et al	2009
Just-in-time	Killi and Morrison	2015

Table 7 captures the significant changes seen over a relatively a short space of time to the definitions of mLearning in relation to purpose: location; technology; function.

**Table 7 - Development of definitions and early features associated with the term mLearning**

mLearning is:	Focus	Author
-Learning that happened without being limited to a fixed location  - any location, at any time  - anytime, anywhere	Location	Sharples (2002, 2005, 2009)  Attewell, Savill-Smith and Douch (2009)  Kadirire (2009)
-Learning on small portable devices  -Any learning or educational provision reliant predominantly on handheld technologies or palm held devices  -Exploration of ubiquitous handheld hardware, telephony and wireless networks to facilitate, reach and support learning  -Computers, tablets or smartphones to deliver educational content to learners  -Handheld hardware; telephony and wireless capabilities	Technology	Keagen (2005)  Traxler (2005)  MoLeNet (2010)  Kukulska-Hulme et al (2009)  MoLNet (2010)
-Learning or educational on handheld technologies or palm held devices	Learning	Traxler (2005)

-mLearning through e-learning -Mobile e-learning -Learning on-the-go (Woodill,		Sharples, Taylor & Vavoula (2007) Traxler (2009) Woodill (2011)
-Immediacy and convenience -Access -Communication across multiple contexts Immediacy and convenience -Process of communication across multiple contexts with people using interactive technologies	Function	Kynaelahti (2003) Parsons and Ryu, (2006) Sharples (2007) Crompton (2013)

Regardless of how different people define mLearning there appears to be a correlation between the individual, physical space, conceptual space and social space and the value that they attribute to learning using mobile technology. Some authors conceptualise mLearning in terms of technologies and function, advocating it in terms of the flexibility afforded to being mobile and learning ‘on the go’ (Woodill, 2011). Scholarly understanding on the use of mobile learning is complex, consisting of many different connected features that are interdependent upon each other (Crompton, 2013). Despite more than a decade of research into mobile technologies the concept and agreement on a definition remains elusive and problematic. For the purpose of this thesis mLearning will be seen as, *“learning across multiple contexts, through social and content interactions, using personal electronic devices”* (Crompton, 2013, p4).

### 2.3 Technology and learning

The use of technology in teaching and learning is not new but enhanced at a time when digital technologies are ubiquitous and interconnection at anytime, in any location is expected by society. Digital technologies affect how we communicate, purchase goods, book a holiday, find and retrieve information, trade, and bank, build relationships and learn. Digital technologies have pervaded and changed the way that we do things in all parts of our lives; this is reflected in teaching and learning. Thus, the proliferation of new technologies in Higher Education (HE) has led to the development and provision of online

course and virtual learning platforms to host educational resources. Technology is now ubiquitous in HE. Interest has been further triggered by the idea of mobility and mLearning. In the context of midwifery education it is commonly expected that students embrace the use of digital tools and technologies through the use of smart phones, tablets, and other multipurpose, multimedia mobile communicative gadgets. The use of these mobile, hand-held technologies has attracted the attention of both researchers and educators, as these emerging digital technologies were said to be re-shaping the way that educators teach and learners want to be taught (Wankel and Blessinger, 2003).

The use of mobile phones has moved from being a novel gadget to a necessary, essential tool. This last decade has seen an increase in the use of hand-held devices and wireless networks across the student community. Students are able to access and connect to digital resources in a variety of places, settings and contexts (Yin et al, 2013). Indeed the tools by which they are connecting give rise to a unique learning environment, one that is recognized as mobile learning. However, introduction of digital technologies in the process of teaching and learning is not new but one that spans several decades. It is associated in the literature with terms such Electronic learning (e-learning), Mobile learning (m-learning) and Technology Enhanced Learning (Ryan & Tilbury 2013, Gordon 2014). In an era where digital technologies are ubiquitous and society is connected, clarity is needed as to the meaning of these terms and how they can be embraced and used with conviction in the arena of Higher Education. This thesis attempts to de-construct what these terms mean and offer a re-constructed, contemporary and clear understanding of m-learning and its contribution to teaching and learning.

This thesis is written at a time when there are many lazy assumptions about technology and learning. Firstly, there is an assumption that technology is transforming the nature of learning. The literature indicates that m-learning has been designed according to three approaches (Churchill, Lu and Chiu 2014) the first being '*learning with mobile technologies*' (Anderson and Blackwood 2004, Song and Fox, 2008), followed by '*learners on the move*' (Wong et al 2010) and finally the '*dynamic, seamless and ubiquitous learning experience*' (Wong and Looi 2011, Ting 2013, Song 2014 and Kearney 2015).

Second, there is an assumption that the use of technology requires a new account of teaching and learning and that traditional theories and models are outmoded. The

relationship between flexible learning and technology-enhanced learning has invaded the landscape of traditional teaching and learning and researchers report the emergence of 'new flexible pedagogies' (Ryan and Tilbury, 2013). Consideration is given to the need for some kind of new framework or taxonomy to distinctively reflect digital learning. Suggestions are made that Higher Education Institutes (HEI's) need to work with this emerging pedagogy and transcend the transmissive, behavioural models of learning and embrace a 'flexible pedagogy' (Scanlon, Jones and Waycott, 2005).

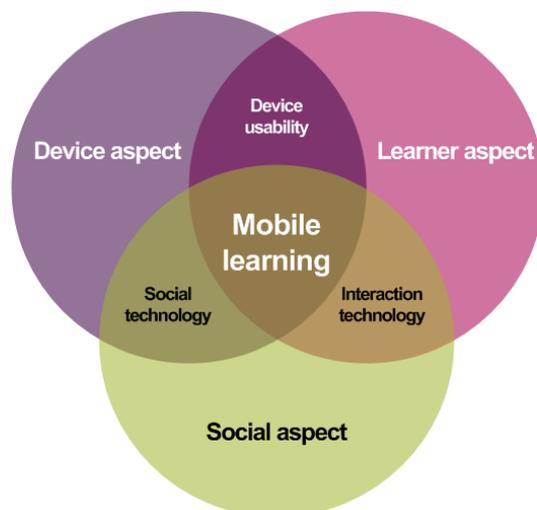
Third, there is growing argument that students set up and learn from informal use of social networks often facilitated via mobile devices (Goodband et al, 2012) giving them increased control over the pace, place and space for learning. It can be suggested that the use of mobile technologies for learning improves students' learning and enthusiasm and attitude towards learning. It does not however suggest that learning resides in non-human appliances but that such technological tools can enhance the flexibility and self-autonomy for learning at a time convenient to the student either working synchronously or asynchronously with other students. The prominence of mobile devices and the immediacy at which information can be relayed appears to have an impact on behavior and the way in which students want to learn. Yet it is this growing dependence and reliance on the use of mobile devices and technology for everyday functions, a good idea? The dependence on electronic gadgets could be conceived as putting the student in a position of power over the individual.

Fourth, an assumption has emerged that younger learners have grown up in this digital age, with a readiness to engage and interact with mobile phones, games consoles and other electronic technologies for communication and entertainment which makes them particularly skilled in the use (both recreational and pedagogic) of such devices. Such young learners have been termed as, 'digital natives' or 'new millennium learners' (Prensky 2001, Sharples 2005, Sanchez 2016). For these millennial students, what educationalists view as emerging new technologies are everyday tools and what is important to them is what the technology enables them to do and how it will enhance their connectivity in the world around them (Oblinger and Oblinger 2005). In contrast, mature learners or old millennial learners are increasingly likely to have Internet connection at home and work and engage with mobile technologies but less likely to use them pervasively or indeed well. Terms such as natives and immigrants need to be used with caution to avoid discouragement and

accusation of being ageist against those who have experienced traditional teaching activities (Naismith 2004). It is not enough for learners to be digital savvy, as this does not necessarily indicate that they can use technology to support their learning.

It is useful to model outcomes in any project as this enables transferability to other contexts and helps the reader to see how the various findings fit together. Models enable finding to be transferable to new contexts and the value of small-scale qualitative studies such as lies in the models they offer rather than the breadth or even the extent of data. In fact there have been various models, which help describe and explain mLearning. For example Koole's (2009) FRAME theory of mobile learning remains widely acknowledged. This framework was initially perceived as being suitable for midwifery education as it was primarily created for nursing students. Within this model different aspects of mLearning and their effects on the outcome of learning are evident. According to Koole's theory (2009) mobile learning is a combination of the interactions between learners, their devices, and other people and is presented as a three circle Venn diagram comprising the learner aspect, the social aspect and the device aspect of mobile learning. Within FRAME, learning occurs when all three aspects overlap as seen in figure 2.

**Figure 2 - FRAME – the Framework for mobile learning (Koole, 2009)**



The FRAME model offers a socio-cultural view of learning as it takes into consideration the social aspect, including the means of communication and the form of the device, and the learner aspect in terms of individual experiences and motivations. It helps see that

mLearning rests on a combination of tool, setting and learner. However it has shortcomings and in particular it is not a model for explaining outcomes in particular contexts such as the study reported here.

In fact, and despite the enthusiasm for the affordances associated with mLearning, reviewing the research in this field leaves the impression that mLearning is still in its infancy in relation to understanding pedagogical and technological limitations (Liaw et al, 2010). However, one useful approach is the MOBIlearn Task Model (Jalil et al, 2015), an alternative way of understanding how the mobility of learners and their devices extend time and space as well as emphasising the interactivity and commutation that represents the 'social' nature of mobile learning. It is specifically designed to support students in higher education (Jalil, 2015). This framework was developed based on the understanding of Vygotsky's sociocultural model, Engestrom's activity model and Laurillard's conversational theories of learning (Sharples, Taylor and Vavoula, 2005; Taylor et al, 2006). Moving away from the traditional scaffolding of pedagogical frameworks this is a techno-pedagogical tool to support learners' activities in mobile environments and the infrastructure is engineered into an application that is downloaded directly onto mobile devices as MOBIlearn2 version 1.0. In this task model framework both educators and learning designers plan for the type of learning and teaching experiences that may work well in their particular context.

To understand the infrastructure that MOBIlearn2 v1 is built upon it is necessary to summarise the key aspects that the model focuses upon. Fundamentally it is based on an understanding that this mobility is the movement between the learning space and technological space (Sharples, Taylor and Vavoula, 2005). The concept is presented in a triangle comprising of three components: subject (i.e. the learner or user of the technology), object (i.e. information, knowledge or skills) and tools (i.e. mobile device). To understand the process of learning within the task model (Appendix 1) Taylor et al (2006) separated the framework focusing on two perspectives firstly, the learning as learners' actions (semiotic space) and, secondly, the technology that has facilitated the learning. This is represented in the models developed by Vavoula (2005) in Appendix 2 (figure 1). The frameworks show the complex relationship between technology, learner, and process of learning.

It also shows how the movement of the learner (mobile learning) between the semiotic space (mental) and learn-space whilst having distinct purposes influences the learning that takes place. This learn-space is influenced by the informal activities that the learner undertakes for example, daily business and a variety of learning methods.

Vavoula (2005) shows the technological space that learning episodes occur when engaging with a device and applications accessing information. This is influenced by communication infrastructures, physical context of being mobile the human computer interaction and interaction with the technology (Appendix 2 (fig2)). The model is useful in showing the different elements involved in episodes of learning within a connected environment. However it seems unnecessarily complicated and separates out the user from the technology.

MOBIlearn2 v1.0 is a software package based upon this model designed to aid the moves between the contextual spaces. It assists by providing a set of tools for planning and organising mobile learning, but is limited in scope and does not contain resources for particular fields of learning. Instead, the model that I found most helpful when considering how and why the phenomenon was the Fitting It In (FIT) model adapted for implementing Information Communication Technology (ICT) within a primary school (Cartwright and Hammond, 2007) and is used in a study of e-learning in Saudi Arabia (Khalid-Ahmed and Ghandi, 2015).

This model was not developed with mobile learning in mind but was a general one, in fact one originating within a grounded theory approach developed in Strauss and Corbin (1998). The key points are described and supported with evidence from the study later in chapter 5.

## **2.4 Pedagogical approaches to support mobile learning**

The focus on technology and its contribution to learning becomes compromised if it overlooks the wider context of learning. Definitions of learning are contested but they share a common idea of moving from one state to another in respect to behaviour, skills, understanding and feeling. Learning theory attempts to make sense of this change of state and often draws on behaviourism, cognitivism and constructivism and now a social

cultural learning tradition (Quinn, 2000). Within the *behaviourist*-learning paradigm, reinforcement of an association between a particular stimulus and a response (for example drill and feedback) is seen as facilitating learning. Mobile devices can support a behaviourist learning process as they can be used to present teaching material, content, questions (stimulus), which require a response and provide appropriate feedback for reinforcement.

Within the *cognitivist* paradigm lays a belief that human beings can construct knowledge rather than just receive knowledge (we are meaning makers). The process of learning can be described as one of assimilation and accommodation, reflecting how the learner incorporates elements of the physical world into his or her own learning logic. In cognitive theories, knowledge and the learning process can be assimilated with memory recall. *Constructivist and social cultural* views of learning provide a much-needed sharper focus on the cultural context for teaching. For example Bruner (1966) builds upon the work of Vygotsky (1962) to take some account of the social aspects of teaching and learning. Bruner saw learning as an active process in which learners construct new ideas or concepts based on their current and past knowledge (Bruner 1966) in collaboration with other people.

Hardless et al (2000) saw social constructivism as underpinning their ideas on collaborative learning for mobile people and constructivism has been enlisted as a support for the goal of turning passive recipients of information to active participants in the co-construction of knowledge (Hill et al, 2000). The use of a mobile device allows the learner to be become part of the dynamic system embedded in a real life context. Whereas behaviourism and cognitivism view knowledge as external to the learner and the learning process constructivism suggests that the learner creates knowledge as they attempt to understand their experiences (Driscoll 2000).

Table 8 outlines key learning theories and their implications for teaching. The final column indicates how each is suited to an App developed for the purpose of teaching and learning.

**Table 8 - Key features of Learning Theories**

<b>Type of learning theory</b>	<b>Theory of learning</b>	<b>Implications for teaching</b>	<b>Activities</b>	<b>Expected behavior of learner</b>	<b>Implications for design and content of App</b>
<b>Behaviourism</b>	Learning is a process of positive reinforcement	Exposition and repeated controlled practice Teacher focused	Lecture Drill and practice Rote learning MCQ tests	Resilient Focused on accuracy	Quizzes provided Structured content Using mnemonic for skills drill
<b>Cognitivism</b>	Learning is a process of accommodation and assimilation	Why teacher focused?	Lecture Visual tools: mind maps, charts to facilitate memorization MCQ tests and essay assessment	Actively engaging with the subject materials Engaging with Authentic subject matter	Rich array of multimedia assets Audio Video Animations Quiz
<b>[Social] Constructivism</b>	Learners create knowledge as they attempt to understand their experiences and do this with others	Group focused	Discovery Collaborative group work Scaffolding Self-guided learning Peer grading/review	Learner builds on personal experience Collaboratively minded	Authentic case study Collaboration tools

The above theories of learning have failed to satisfy some proponents of e-learning and in particular they have not been seen as capturing the distinctiveness of the contribution of mobile learning. Mobile technologies and the popularity of wireless communication offer the opportunity for the learner to learn within a new learning environment, which places them in context within their own world (Tsai and Hwang, 2013). There have been several attempts to conceptualise learning with the aid of new technology. Underlying these attempts have been the twin concepts of 'flexibility' and 'mobility'.

It is proposed that technology is now interconnected in a more seamless manner and that both technology and flexible pedagogies forge a symbiosis. The Higher Education Academy (HEA), Department of Health (DH), Joint Information Systems Committee (JISC) and other organisations all acknowledge the potential of mobile learning and in different ways discuss associated pedagogy. Suggestions are made that Higher Education Institutes (HEI's) need to work with this emerging pedagogy and transcend the transmission, behavioural models learning and embrace a 'flexible pedagogy' (Scanlon, Jones and Waycott, 2005). It can be argued that mobile learning is recognition of the ever-wider acquisition of mobile devices (Sharples et al, 2002) as they become smaller, faster, cheaper and permit a web of connectivity (BECTA, 2006).

Mobile technologies are said to have the potential to support more flexible, more autonomous and more ubiquitous forms of learning (Vavoula, Pachler, and Kukulska-Hulme 2009). It is open to interpretation how the learner acquires knowledge and skill transfer through the use of technology enhanced applications, it is surely a more complex process than just accessing teaching and learning materials with a set of gadgets or tools. Commentators tend to focus on place, space and time of learning (Katz & Askhus 2002). Of course more critical voices point out that challenges still need to be addressed. Colley and Stead (2003) recommend that the technology is assessed for its suitability to the learning tasks and that advantages and disadvantages of each technology should be made before deciding which one to use. Naismith et al (2004) warned that a blended approach to enabling learning with mobile technologies was essential when considering the implications for the learner, teacher and curriculum content. However, there is also a cost implication for the student, the HEI and facilitators and a cost model for infrastructure, technology and support services is agreed when considering the use of emerging technologies. Naismith and Corlett (2006) identified five key features for success in

mobile learning these are: access to technology, ownership of a device, connectivity and integration and institutional support.

In rejecting traditional theories of learning connectivism has been offered as a theoretical framework for learning with new technology laying particular emphasis on the learners' engagement within a web of informal and formal networks (Forster, 2007). Siemens (2004) proposed connectivism as a learning theory for the digital age but concepts such as flexible pedagogy and connectivism have not always been well received (Wingkvist and Ericsson, 2010). Table 9 summarises what has been said about learning theory and mLearning and the teaching, expected behaviour of the learner and benefits for the learner.

**Table 9 - New theories of teaching and learning with mobile technology**

'Theory'	In brief	Implications for teaching	Expected behavior of learner	Benefits for the learner
Flexible pedagogy	Focuses on giving students choice in the pace, place and mode of their learning Combining best of established learning theories	Moving away from transmissive, behavioural models towards constructivist or socio-cognitive models Opportunity to prepare and plan for a range of learners	Active learner Increased motivation to learn Learner centred	Places the active learner at the heart of activities Collaborative working
M learning	Learner takes advantage of learning opportunities offered by mobile technologies. Learning that takes place when the learner is not at a fixed location.	Facilitation role as well didactic teaching  Developing appropriate learning materials Networked	Active learning Didactic and Discursive learning Flexible learning space Increased motivation to learn Empowered and self-autonomous	Long term learning Learn any place and time at own pace Learn in isolation or as part of a linked community of learners
Connectivism	The formation of connections between nodes	Facilitation role provision of learning	Self-autonomy Independent learner	Networked learner

	of information distributed with network, social and technologically enhanced tools	materials to download Signposting to areas of interest	Active learner	Access to increased material and communication within global networks
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The way we think of technology and learning raises several critical questions: is learning with technology really new? Is it based on an idealised picture of the learner? Does it make assumptions as to the universal access and appeal of new technology? Why does the introduction of technology unsettle ideas about ontology and epistemology? This research will explore these and other issues and critically consider the idea of a paradigm shift in educational theory in the later discussion.

## **2.5 Mobile learning in context with professional nursing and midwifery education**

In order to clarify how mLearning has been introduced and used in nursing and midwifery, some relevant studies have been selected to illuminate best practices. These were a mix of studies qualitative and quantitative in nature. The literature mainly addressed nursing students, as there was paucity, at the time of my study, of research directly related to midwifery education. This is a limitation of the literature review. However, reviewing the articles and studies in nurse education sensible conclusions can be reached about midwifery. Thus, the literature review focuses on the affordances of mobile technologies within the clinical practice area as a means of complementing theoretical teaching and learning and minimising the perceived theory to practice gap. Indeed, the use of mobile technologies for classroom-based learning is well reported and the use of smartphones in the classroom affords nursing students with real-time, Internet-accessible information that enhances their academic learning strategies and aids the transformation of knowledge (Day-Black, 2015).

With an increased demand for Continual Professional Development (CPD) learning for health care professionals to embrace new mobile technologies, educators explored the concept of 'blended' learning as an effective approach for teaching and learning. The results of a study by Gerkin, Taylor and Weatherby (2009) demonstrated that the use of

e-learning provided both a satisfactory and effective alternative learning medium to the classroom. Leken et al (2010) connected learning model for disseminating evidence-based care practices in clinical settings was later adopted to enable the sharing of key clinical guidelines amongst staff working across a variety of clinical settings as a means of ensuring they were up to date with best practice.

The introduction of electronic technology into nurse education assisted the shift in opinion from traditional ways of learning to either a blended approach or online learning. Managers started to recognize the flexibility afforded by online learning materials in that, online courses reduce the 'time' that would be lost in the workplace, the need to back fill a nurse or midwife whilst attending training and that the learning resources could be accessed at any time of the day. Friedlander (2006) examined factors related to nurse participation when undertaking online continuing nurse education and findings indicated that there was a general reluctance by nurses to engage with online materials and activities, as they preferred face-to-face interaction for learning. Results of a small-scale qualitative research study exploring the opinions of registered nurses working in a clinical transfusion environment who had completed an e-learning programme on safe transfusion practice found that the e-learning course did meet their diverse learning styles. It also revealed that in their opinion, technology alone is insufficient for clinical learning. They advocated a blended approach to learning, in an attempt to bridge the theory practice gap when supporting the integration of knowledge to clinical practice and skills (Cottrell and Donaldson, 2013).

The combination of traditional face-to-face teaching methods with the use of e-learning afforded flexibility of learning, advantages in terms of economics in providing staff training and opportunities for optimal learning (Cook et al, 2010). However whilst blended learning has advantages and a range of strategies for its effective provision can be harnessed, there is caution that a no 'one-size-fits-all' approach is effective for everyone. Regardless of the teaching and learning environment it is difficult to measure what learning has taken place (Milanese et al, 2014). Several years later the same message of caution is being reiterated and a move towards a heutagogical approach to professional learning (Green and Huntington, 2017).

An increased number of studies revealed that students engage in a variety of ways with learning resources using their mobile devices both in the classroom and clinical setting. Clinical education is an area that values the acquisition of knowledge and practical skills in different learning contexts, across a variety of teaching environments, such as the classroom, skills simulation laboratory and clinical setting. As such it supports situated, experiential and contextualized learning, which provides information 'just-in-time' as seen in previous work by Kukulska-Hulme and Traxler (2005).

As healthcare students face a variety of challenges to learning, especially in the clinical placement environment there is still a perceived to be a theory-practice gap (Landers, 2000). The studies included in this review show how students can use mobile technology to advance their learning. Wyatt et al (2010) conducted a longitudinal cohort study involving nursing students and their use of Personal Digital Assistants (PDA's) in the clinical setting. They used the device to connect nursing students with peers and nurse practitioners whilst in the clinical setting and found that a co-operative learning community was created. They also reported that PDAs, specifically pocket sized were useful tools in the clinical setting and that the whole cohort benefited from using them. The choice of device is individual and mainly dependent on what technology is available at the time. A further study (Cibulka and Crane-Wider, 2011) supported the use of student nurses using (PDA) in the clinical area, this study focused on accessing clinical information. The findings recognised that using mobile technologies was an important competency that improved the quality of nursing practice.

As the use of mobile technologies in the clinical practice area increased the impact of mobile learning was examined. Du et al (2010) introduced the mobile device as a mode for text messaging in a field experiment. This study focused on the communication of lean messages, involving 232 participants. It served to illustrate the increased speed of communication through short text responses and especially in answering questions in a two way process between the students and teacher. They concluded that the speed in which instructions could be conveyed to enhance individual practice and reinforced learning.

Novel intervention and use of mobile devices were used with nursing students to learn from each other and mentor others in the clinical area on how to use mobile technology

for information whilst on placement (Bogossian et al 2009). In the early period of research into the use of mobile technologies with health care students, researchers focused on technological advantages and benefits of the device, portraying and adding to the body of knowledge that already exploited the flexibility, and usability of mobile technology for learning. Wu et al (2011) reported that nursing students found the mobile device easy to use and met their needs whilst the ability to carry the device in their pocket and have access to information anytime and anywhere was highly valued (Morris and Maynard 2010, Hudson and Buell 2011). This reinforced the preference for mobile devices, as they are small, lightweight and easy to transport.

As technology improved and gained in popularity, several Applications (Apps) were developed for mobile devices. The early Apps emerged from calculator functions, such as: drug calculators, pregnancy dating calculators; Body Mass Index (BMI) calculators. With greater emphasis being placed on learning in the clinical area and student midwives being mobile, not having one fixed location for the activity of learning, this is one key area where mobile learning should be highly desirable and opportunities taken by educators and learners to engage in this technology to enhance their learning on the go.

Some students recognized that their pharmacological knowledge was enhanced as the device permitted them access to a drug database when they needed to know essential information (Farrell and Rose, 2008). Others reported increased confidence in skills when using short video clips or podcasts accessed via the mobile device during placement (Clay 2011, Stiffler, Stoten and Culle, 2011) to enhance learning.

Flannigan and McAloon (2011) compared the use of an App for drug calculations against using the British National Formulary for Children (BNFC). They focused on accuracy of calculation, speed and confidence of Doctors to prescribe using the smartphone App. The participants were recruited in a paediatric department of a District General Hospital, involving twenty eight Doctors and seven medical students. Overall they found that they drugs calculator was more efficient than using the BNFC and participants were confident in calculating in this manner for prescriptions.

As the use of mobile handheld devices continues to grow in professional education, responses to how the devices can be optimally used as a tool for learning challenges

educators and students. Smartphones and mobile applications (apps) that are downloadable expand the functions of mobile technology further to support students in any learning environment. Nursing students support their learning with a range of educational apps such as calculators, drug reference guides and medical dictionaries. Not all apps are beneficial and it would be advantageous to review them before purchasing and downloading onto a mobile device. This can be seen when caution as to the quality and authenticity of apps for cardiopulmonary resuscitation training revealed that out of forty-six apps reviewed in this area only five were ranked as acceptable for use as they reflected the correct British Life Support guidance (Kalz et al, 2014). Care must also be taken when developing apps for mobile technology in health care to ensure that the correct guidance has been included, information is accurate and credible and that sufficient design arrangements have been considered for automatic updating of essential information.

A mixed methodological approach was used to explore nurses' preferences in technology-related learning (Pilcher and Bedford, 2010). A total of 387 nurses working in six neonatal specialty units were recruited to complete a paper questionnaire and participate in face-to-face in-depth interviews, which analysed their preferences in technology-related learning, computer literacy skills, learning styles and variance in age. The research data indicated that the majority of participants owned mobile learning devices such as iPods, Balckberries or iPhones but reported having minimal use of these devices for learning purposes. The responses from the participants indicated that the majority had a preference for lecture and classroom interaction. Participants indicated a willingness to learn with technologies such as online, webcasts and handheld Internet enabled devices. Increased participation in learning was revealed when learning involved the use of high-fidelity mannequins for clinical skills such as cardio pulmonary resuscitation.

As early as 2010 global initiatives aimed at improving health within the population of pregnant women in rural locations in Ghana with the concept of 'mobile midwife' were introduced. This responded to the emerging concept of mobile health (mHealth) and the Millennium Development Goals to strengthen health systems in under developed countries. Entshei et al (2010) undertook a qualitative study using semi-structured in-depth interviews and focus groups with pregnant women in low-resource settings. They reviewed the impact of sending text messages to women containing messages about the

*ABC's of maternal and neonatal care.* They concluded that embracing mobile midwife as a trustworthy and constant source of support for women in rural areas could be a tool for improving maternal health. Whilst in essence this study appeared to have benefits it was only small in size. The concept of the 'mobile midwife' in Ghana was reviewed more recently in by LeFevre et al in 2017 and has come under criticism. They warn that mobile health programmes and the use of mobile technologies are reliant upon the effectiveness of the platforms used to send the messages and caution should be applied to the use of 'pushing' out voice messages as some messages may not be delivered and are reliant on effective technical functions or effectiveness. Alternative delivery modes are being considered to ensure that there is equity across all regions and users.

Aimed at midwives undertaking a CPD module of learning, a small research study was undertaken to explore how mobile technology could be used for the acquisition of clinical skills when learning how to perform the newborn infant physical examination. A small cohort of midwives each received a handheld mobile device (iPod) pre-loaded with short video files and Reusable Learning Objects (RLO) to review and reinforce the systematic examination whilst working in the clinical area. Participants confirmed that mobile learning afforded them flexibility in time and place of learning and opportunity to review the material at their own convenience. This study revealed that mobile technology was a creative and innovative approach to learning and placed the learning firmly in the hands of the learner (Clay, 2011).

In a randomized controlled trial (RCT) success was reported in the use of mobile-based video learning outcome. In this study by Lee et al (2016) student nurses participated in a pretest and post- test performance of a clinical skill: urinary catheterization. In this RCT a total of 36 students were assigned to an intervention group and 35 into a control group. The intervention group received a video clip teaching the skill of urinary catheterization to download and use as frequently as they chose for a week prior to returning to the simulation laboratory for assessment. The control group was not given access to the video. All students were assessed simulating the clinical skill and the intervention group were found to be more confident and in control showing significantly higher levels of learning than students in the control group. The researchers suggest that video clips using mobile devices are useful tools that educate student nurses on relevant clinical skills and have the potential to improve learning.

In contrast to these benefits, concerns have been raised in the literature that mobile devices when used in the clinical area can become a major distraction, as qualified staff do not always perceive them as being meaningful learning tools. Students reported a reluctance of to use the mobile device in the ward areas in front of patients/clients as it may be perceived as being unprofessional (Byrne-Davis et al 2015). The risk of disease transmission, interference with equipment and potential theft of the device were also reported as being barriers to using mobile technology and smartphones in the clinical area (Phillippi and Wyatt, 2011). When considering the effectiveness of mobile devices in the clinical areas the perception of managers and students has been challenged. Using a qualitative descriptive methodology, semi structured interviews were conducted with student nurses and nurse managers about their perception of using a personally owned handheld device to support clinical decisions in the clinical area. Only five nurse managers were recruited and confirmed that they all perceived the use of a handheld device in the clinical area as unprofessional and a risk, in that student nurses would not act in an ethical manner when using this technology. In addition nurse managers highlighted concerns about the costs and safety of using the technology rendering the practice as being problematic in the clinical area in which the study was located (George and Crossan, 2017).

A repeated finding across studies are that technical issues with mobile devices create a barrier to use. The main problem associated with the devices included; limited battery life, acceptability in the clinical area for charging own device, slow speed when loading information and limited or nonexistent Wi-Fi connection (Morris and Maynard 2010). Whilst the use of mobile devices has a valuable place to assist learning in the clinical placement setting consideration needs to be given to the access of wireless connectivity, overcoming firewalls in place by hospital IT systems and adequate provision of technological support for the users (Raman 2015, McNally et al 2017, O'Connor and Andrews 2018).

Over a sixteen-month period through six focus groups, research participants explored educational strategies to support digitally differentiated nurses' engagement with CPD activities in an online research. Green and Huntington (2017) reported findings that access to a quiet space and computer away from the clinical ward area along with access to CPD

resources from anywhere and at any time can be an effective approach in the provision and uptake of professional development. They recognized that a 'one-size-fits-all' approach to resources offered would not meet the needs of such a diverse group of professionals and that self-directed learning in this context offers more substantial benefits to those seeking professional development.

There appears to be discourse between the use of mobile technology in clinical settings and the potential benefits of having immediate access to evidence based resources.

A small qualitative descriptive design study by Beauregard et al (2017) gave recognition to new millennial learners in being able to identifying the potential use of smartphones to enhance the way in which nurses practice in a community setting. However, the findings from the students' narratives describe a reluctance of organisations to foster and accept this cultural shift in learning and technology. This reinforces the message that managers appear to be unwilling to permit the use of mobile technology in clinical practice settings.

In response to the challenges that the provision of CPD brings, health care organisations, professional bodies and institutes of higher education now provide a variety of online programmes of learning and have encouraged the use of online portfolios (e-portfolios). Over time there has been reluctance to engage in online learning programmes as professionals often perceived it negatively as they were familiar with face-to-face interactions in a classroom. With the growing demands of service delivery, increasing demands on CPD and post-registration education online learning or e-learning programmes appeared to be the answer and a variety of research exploded into the advantages, disadvantages of using technology to deliver educational resources.

It is accepted practice within nurse and midwifery education that clinical progress and attainment of clinical competences and grading of practice performance needs to be continually assessed and documented within a physical paper based logbook. Success in adopting mobile technology in nursing education has been reported by the use of a mobile e-portfolio to promote nursing students clinical learning. Chin-Yuan and Cheng-Chih (2016) conducted a mixed methods study combining qualitative and quantitative data to investigate the effects of using a mobile e-portfolio whilst on a three-week clinical placement. The mobile e-portfolio permitted students to record, assess and reflect upon their learning from a variety of settings, classroom, clinical area and home. The results of

the study demonstrated that student nurses made professional progress in both theory and practice using the e-portfolio system. The researchers also highlighted that the success of implementing the e-portfolio system is dependent upon having the correct type of mobile device, clear guidance to students on how to access and construct the e-portfolio and how to use the e-portfolio in the clinical setting.

More recently, O'Connor and Andrews (2018) explored with a cohort of two hundred nursing students across a four-year nursing programme their opinions of using smartphones and mobile apps to support learning in the clinical environment. A range of apps was downloaded onto their devices to use during their studies. The majority of participants reported owning a smartphone but only half of them reported using mobile apps to assist in their learning. Within this study nursing students identified numerous benefits of mobile technology, which resonate from previous work. Reported benefits included, better access to educational material, a reduction in anxiety levels as they had access to learning resources when in the clinical area and improvements in knowledge. Common concerns included the non-acceptance by nurse managers for using handheld devices in the clinical area, cost of upgrading devices, interference with Wi-fi connectivity and cost for purchasing apps. These students identified perceived poor quality of educational content available on mobile apps as a barrier to adopting mobile learning in the clinical area.

Electronic learning has notably transformed the learning landscape for health care professionals, affording them access to learning resources at a time that is convenient to them. This is essential as following registration as a health care professional each individual is required to undertake regular professional and mandatory training to ensure that his or her knowledge and skills are up to date and continue to meet the needs and demands of service delivery. The lack of study leave can prevent them from advancing their professional development and delay promotion. Clinicians will either request to be released from the work place for a few hours a week, take personal annual leave or use their days off duty to maintain and achieve their professional development.

There is a growing abundance of maternity related Apps available to download, targeted at providing information to health care practitioners, women and their families. These range from clinical reference Apps: evidence-based care guidelines; electronic health

records; signposting to pregnancy information; newborn care. With an increased demand on the use of mobile devices and Apps, there is minimal evaluation on their effectiveness. This is an area that could be developed in the research arena to ensure that appropriate and professional Apps are being developed and shared for the correct purposes and not just for 'trending' use of mobile Apps.

## 2.6 Chapter Summary

This chapter has presented a narrative on the search strategy used for accessing relevant literature on the phenomenon on mobile learning. The extensive literature has enabled the plotting of several definitions' and the development of mobile learning. A question remains as to where e-learning stops and mLearning begins but for the purpose of this thesis mobile learning is accepted to encompass, "*learning across multiple contexts, through social and content interactions, using personal electronic devices*" (Crompton, 2013, p4).

Within the literature there is a repeated argument that emerging technologies require new pedagogical approaches. Commentators suggest that it is not the technology that is important but the pedagogy and argue that the focus should be on learning. The use of emerging technologies suggest a 'flexible' approach is needed and a consideration of learning theory. The mobile devices enable the learner to have flexibility in place, time and space in which learning takes places. These are among the reported benefits of mLearning. In contrast the flexibility of using mobile technologies: anytime, anywhere, on the go and just in time can be a challenge to the learner and a constraint is the reliance upon connectivity to an Internet or Wi-Fi service.

### Summary Points

- There is a lack of clarity on the definition of mLearning as discourse remains between where e-learning stops and mLearning begins.
- There is a notion that new emerging technologies give rise to new flexible pedagogical approaches for technology-enhanced learning.
- Consensus in the literature is, that it is not the technology that is important but the pedagogy; therefore commentators suggest that the focus should be on learning and not technology.

- There is a strong sense that emerging technologies demand the use of ‘flexible pedagogies’ to design learning that meets the needs and habits of the ‘Millennial’ learner.
- Reported benefits of being able to learn any place, any time and on the go. Several challenges for the student, academic and educational institute when engaging with mLearning were also highlighted.
- Reported benefits for the student learning experience outweigh the challenges as they reflect the users need to focus on the flexibility of using mobile technologies: anytime, anywhere, on the go and just in time.

## 3.0 CHAPTER 3 - METHODOLOGY

### 3.0 Introduction

Chapter three presents a justification for the research design, methodology and methods. Section 3.1 explains the research design, research paradigm and axiology. Opportunity is taken to defend the use of a bounded case study, the setting for the 'case' and to set out the ethical considerations. Section 3.2 presents the research methodology and methods and provides justification for the combined use of quantitative and qualitative data collection. Section 3.3 outlines the function of methodological triangulation from each research method and section 3.4 provides a short chapter summary.

### 3.1 Research Design

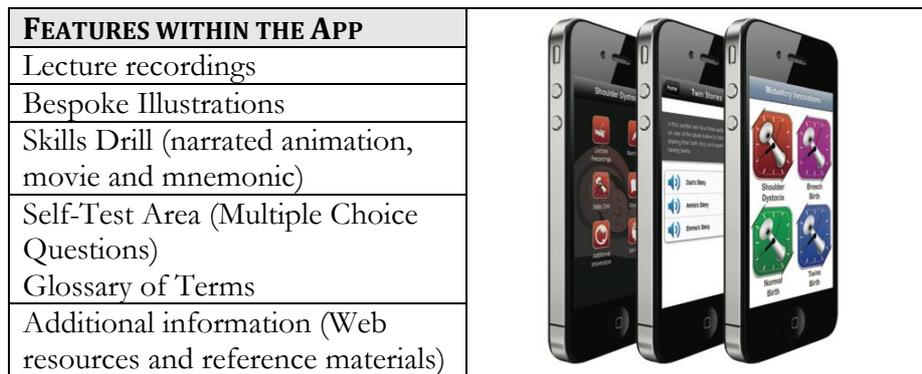
This research adopted a bounded case study approach as this permitted a more in-depth exploration of the topic; especially relevant, as social phenomena are complex and heavily bounded by context. The 'case' is a single student cohort of student midwives on the BSc (Hons) Midwifery Degree programme. Yin (1994) suggested that a single case study is an appropriate research design as it has the ability to discover fundamental phenomenon of an existing theory. It is understood that the object of the study, the 'case' appears to be the common denominator for case study research (Yin 1994, 2009, Gillham 2001).

According to the literature the concept of a case study remains a subject for debate amongst authors (Ragin and Becker 1992, Yin 1994), but while several definitions and concepts of what is understood to be case study research exist, nearly all suggest that cases are bounded. Case study research has gained momentum as an effective methodology to explore and understand complex issues in real world settings. In this 'case' the aim was to explore how learners made use of mobile technology and to understand the complex issues, challenges and consequences of such within their own real world settings.

The context of the study was the general one of exploring the use of mobile learning and technologies in teaching and learning. However, in order to gain an insight into *how learners made use of mobile technology* the first phase of this study focused on how the learners in the

‘case’ used a bespoke Application (App) for learning. It is important to introduce the App, so its position within the study and alignment with data collection methods (OSCE and survey questionnaire) and data analysis can be given. The App was carefully designed to support the learners’ acquisition of knowledge and skill in the management of one obstetric emergency, Shoulder Dystocia (SD). It was designed for use on an ipod, iphone or ipad device. At the time of the study, this ‘case’ of second year student midwives (n= 34) undertaking a module of learning which focused on managing ‘emergencies in childbirth’ were invited to download and use a free version of the bespoke multi-media shoulder dystocia App from the iTunes store. The features contained within the App were available as a menu to select learning assets; which included: lecture recordings; bespoke illustrations; narrated Skills Drill with bespoke animation; self-test area; glossary of terms; additional resources and an authentic video. Image 1 captures the features within the SD App.

**Image 1 - Features within the shoulder dystocia APP**



The integration of the App had been a trigger for the study and as such a good starting point, although it is not the focal point of this case study.

Case study methodology developed in education with the work of Stake (2006) and Merriam (2009). While case study research has interpretivist roots, researchers such as Yin (1994), Glaser & Strauss (1967), Johansson (2003) and Brown (2008) have all demonstrated an interest in qualitative methodology and the application of experimental logic to naturalistic inquiry which strengthens a previous theoretical position. Furthermore, the term ‘case study’ is commonly used in Nursing and Midwifery education and practice to describe medical scenarios, usually based on either personal experience or

as exemplars or 'vignettes' to demonstrate important messages and application of teaching and learning (Yin 2009).

Case study designs are used in a range of disciplines, particularly education, sociology, business, health and humanities and are effective in addressing a wide range of research questions (Harrison et al, 2017). They are often defined according to representativeness. The cohort of student midwives are familiar to me and from a personal and anecdotal perspective they are similar to other student midwives and students on nursing and similar courses allied to health such as Physiotherapy, paramedic science or Occupational Therapy around the United Kingdom (UK). In this study the 'case' (student midwives) is broadly representative of midwifery students in general terms of demographics and motivation. However, student midwives are not representative of other typical undergraduate students on non-health related courses. Reasons for this include, the vocational nature of the health studies and the role of professional requirements from each respective professional regulatory organization such as the Nursing and Midwifery Council (NMC) for nursing and midwifery, General Medical Council (GMC) for doctors and Health Care Professions Council (HCPC) for all other allied health professionals. Unlike the typical undergraduate student the student midwife has to attend work based clinical placements throughout the duration of the course alongside their studies, which gives them a full time, five day a week, forty-five week annual programme.

Kuhn (1962) first used the term paradigm to indicate a framework with a set of beliefs, values and assumptions regarding the nature and conduct of research. The idea of a paradigm has aided my understanding and shaped the methods used to explore this investigation of mobile technology. A research paradigm covers the ontology and epistemology of the research and suggests a research method to address the research questions (Bergman, 2010). For the purpose of this research a mixed approach has been employed (Johnson and Onwuegbuzie, 2014) and this has strong pragmatic undertones. A pragmatist believes that that the best method to use is one that solves the problem. This case study used both a qualitative and quantitative research approach with different data collection methods.

Qualitative research has been used in fields of study such as education and sociology for some time and has grown in popularity within health research. The qualitative method

enables a richer, deeper understanding of the meaning that, in this case, the students place on mobile learning and the relationship they have with technology (Denzin, 2017). Within this thesis qualitative data include documentary data, focus group transcripts and interview transcripts. Qualitative research enabled me to reveal the attitudes, opinions and feelings of students as expressed in words, rather than numbers as data for analysis. While quantitative research tends to focus on frequency, intensity or duration of a behavior, qualitative research methods permit the exploration of beliefs and values leading to an explanation of behavior. The primary aim of qualitative research in this thesis is to gain a better understanding of phenomenon through the experiences of those who have engaged with using technology enhanced learning tools. Using in-depth methods of semi-structured interviews and focus groups I was able to generate descriptive rather than predictive (Bettany-Saltikov 2012) data on the learners' perceptions of technology enhanced learning through mobile learning and crystallised their perceptions and behaviours when engaging with emerging technology tools.

Quantitative methods meanwhile are associated with measuring variables using numerical systems (Kaplan, 2014) and enable a general understanding of a phenomenon, in this case what devices students owned and how they used them. In this study data collection involved the use of questionnaire and data were captured in numbers, for example the percentage of students within the case that owned a hand held device.

By combining both quantitative and qualitative data I was able to gain both a general and in-depth understanding and ultimately to address the overarching question. As the researcher I maintained the integrity of each data set and regularly reviewed the stages in the research process by stopping, reflecting and reviewing. This combining of qualitative and quantitative approaches led to a triangulation of data (Thomas 2011) and my analysis provided different views and insights on the challenges associated with emerging technologies and strengthened the reliability and validity of the research. There is a sense that when the quantitative data and qualitative data are combined they are more powerful (Holloway 2005). The data gathering and analysis are outlined in section 3.2 of this chapter.

### 3.1.1 Ethics and research access

Prior to commencing the research study ethical approval from my registered place of study and employing Higher Education Institute (HEI) was granted (Appendix 3). In addition line and reporting managers granted permissions to engage in research activity. Responsibility to research participants is of paramount importance. This axiology is also extended to the individual researcher, supervisor, colleagues and panel to whom the findings will be presented. Adhering to the main ethical principles of autonomy, beneficence, non-maleficence and justice (Beauchamp and Childress, 2014) were fundamental in this study. The autonomy of the participants (students) was upheld by gaining their consent to participate freely without being unfairly coerced into participating. A copy of the consent form used is available as Appendix 4. Participants were informed about the study via email and a message on their programme web platform. They received a participant information leaflet outlining the aims of the study, offered reassurance that declining to participate would not affect their studies and provided with a general outline of what was expected during the study (Appendix 5) and details of how the data would be collected. It was not the intention of the researcher or in the nature of the research to cause any harm to the individual participants and the hope was that the data will be of future benefit to the student population. As the researcher, I was mindful to address, check and reassess the principles of beneficence and non-maleficence throughout the research study. A risk analysis was completed to consider the potential harms to the participants; although this was considered to be minimal.

The participant's identity and anonymity was protected and upheld throughout the study by the use of the students' unique identifier on the returned consent documentation (Caldicott, 2010). Reassurance was given that all research data (survey questionnaires and data from the OSCE, focus groups and semi-structured interviews) would be stored and locked in a cabinet/drawer in a locked research office. During the data analysis stage, all data material was stored electronically by encryption and computer password protection (Data Protection Act, 1998, Caldicott, 2010).

## **Ethical issues for the Objective Structured Clinical Examination (OSCE)**

All participants gave informed consent for their OSCE performance to be observed and recorded using documentation. As I was a member of the academic team known to the students there was a heightened awareness again for potential researcher bias, so minimizing bias was a key consideration when observing the OSCE. Further reading about researcher bias and ‘insider research’ was undertaken to reduce this occurrence and led to additional exploration of ‘unconscious bias’ and how to avoid it with research subjects.

All participants enthusiastically engaged in the opportunity to have a formative OSCE before using the shoulder dystocia App and perceived this as a learning opportunity to perform the simulated skills under informal assessment conditions. I refrained from being involved in the process of the informal assessment and attended each OSCE assessment as an independent observer. When the participants returned to undertake their summative OSCE assessment the researcher did not attend the simulations but permission was granted to observe the documentation generated on each performance to be used as a comparison between the formative and summative assessments.

## **Ethical issues for the survey**

Permission was granted to use the Bristol Online Survey tool for the survey. An additional layer of consent was incorporated into the survey within the introduction and participants were made aware of how their responses would be stored in the system and retrieved by the researcher. The electronic system automatically recorded the participant with a code number when activating the survey and these codes were used to identify each response giving additional protection to their identity.

## **Ethical issues in focus groups and semi-structured interviews**

Clear statements were embedded within the consent form to gain permission and consent for the use of a digital device to capture audio and dialogue during the focus groups and semi-structured interviews. During the focus groups students also consented to the use of photography to illustrate their active participation and gave permission for the use of their photograph in this thesis. It was clearly explained to participants that the data

recorded via a digital device would be transcribed and each were offered an opportunity to check the transcript of the focus group discussion and semi-structured interviews for accuracy and correct representation. No students voiced the need to take this opportunity, they appeared satisfied that the field notes taken at the time of the data collection were an accurate representation of the event. The participant code number in the digital data was used to analyse recordings so that anonymity was maintained for each response. Participants were satisfied that once the digital audio recordings had been transcribed they would be held for a period of one calendar year in a locked and secure desk within the research department at the researchers place of work and thereafter retrieved and destroyed. The potential for bias occurs, as this was 'insider research' (Holloway, 2005). However, being an 'insider' can also be an advantage as the researcher has significant background, knowledge and understanding of the students and the context in which they are studying (Brannick and Coghlan, 2007). It is difficult to see how anyone not connected with the programme could carry this study out in the first place.

### **3.1.2 The Setting, sampling and study participants**

The focus of my case study was to explore the students' experience of engaging with mobile technologies to support learning within a BSc (Hons) degree programme for midwifery delivered at a local university. The study concerned Midwifery students, 34 in total within the second year of their BSc (Hons) Midwifery programme. The students were a sample of convenience as they were accessed through the Higher Education Institute (HEI) in which the researcher is employed. Second year student midwives were selected as they were deemed to have reached the most suitable stage of their educational programme and were least likely to be disrupted by participating.

The BSc (Hons) Midwifery programme delivered at the HEI where the study took place is integrated between theory and clinical practice. It is divided into three separate phases over three years. The first year concentrates on acquiring the fundamental skills of midwifery and is related to normal pregnancy and childbirth. The second year focuses on complications in pregnancy, childbirth and the postnatal period. Finally, the third year culminates in the development of proficient autonomous clinical skills that prepare the student for the point of entry onto the professional register. Students have to achieve fifty percent of their training in theory and fifty percent in clinical practice in order to meet the

professional regulatory requirements set by the Nursing and Midwifery Council (NMC, 2009) and as such, they commence clinical practice from week eight of their programme. Towards the end of their third year of study, students transition into full time clinical practice in preparation for completion. It was therefore deemed more appropriate to access the second year students, as they were more convenient and easier to access.

At the time of the research study all participants were female, which is an expected, demographic in the gender of midwives and representative of the target population (Royal College of Midwives, (RCM), 2018). Some interesting features about the cohort used in this study coincide with the findings of the RCM when considering the state of maternity services in England (RCM, 2018). Table 10 below illustrates the details of all 34 students and rather than use their name and in order to protect their identity each student is identified by their unique student number. In the table the students have been ranked in order of age so that it is easier to view the participants, with 12 participants being aged 19 years to 21 years of age, 6 aged 22 years to 25 years, 7 aged between 26- 30 years of age and 9 aged between 31 years to 40 years. The age profile of student midwives entering training programmes has changed quite dramatically with an increase in the number of students between the ages 19 to 25 years of age. This is a positive trend as it will complement the needs of the National Health Service (NHS) to employ younger midwives as a high proportion of qualified midwives are in the upper age limit of 45 to 55 years of age (RCM, 2018). The NMC and RCM both report the need to recruit more midwives, as the majority of midwives in England are fast approaching retirement.

It is interesting to note that within a small cohort of 34 students only nine had chosen to move to the city where the HEI is located. As this was a cohort of students known to me I did have knowledge that none had declared a learning disability or additional requirements, therefore I did not have to consider any adjustments to meet individual learning needs. Table 10 highlights the geographical location by region of where the students were living prior to commencing the course. This table does not illustrate the high number of students within the cohort who choose to travel and although are living within the locality of the West Midlands, travel long distances to the university campus and clinical practice areas. As midwifery is a graduate profession the table illustrates the highest qualification at time of entry, this being a mixture of attaining qualifications at 'A' level or undertaking a subject specific access course. Sample sizes are typically small in

qualitative research and there are no hard and fast rules for sample size (Patton, 2002). In this case all the students in this cohort were included. The study is interesting not just for what light it throws on learning with new technology but for the particular context of professional learning contexts and also raises questions about the conceptualization of professional learning.

**Table 10 - Participant details**

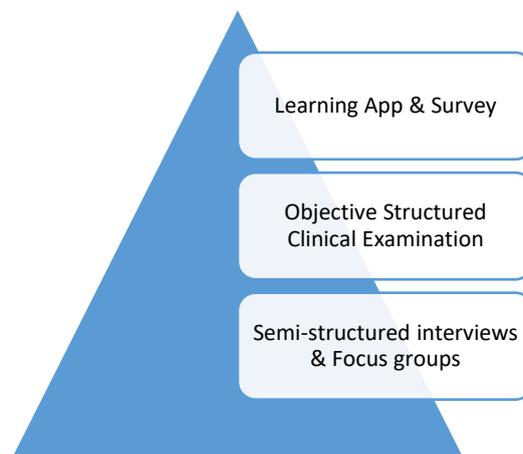
<b>Student</b>	<b>AG E</b>	<b>Highest Qualification at entry</b>	<b>Demographic Location at start of course</b>	<b>Student 'Living In'</b>	<b>Work prior to course</b>	<b>Type of mobile technology device owned at start of course</b>
1	19	A level	South West	Yes	PT/assistant	iPhone, ipad
2	19	Access	West Midlands	No	None	Android phone, tablet
3	19	A Levels	South West	Yes	None	iPhone, ipad
4	19	A levels	North East	Yes	None	iPhone, ipad
5	19	GCSE/Access	West Midlands	No	PT/assistant	iPhone, ipod
6	19	GCSE/ Access	East Midlands	Yes	None	iPhone
7	19	GCSE/Access	East Midlands	No	PT/assistant	iPhone
8	20	X2 A Level BTEC Fashion	West Midlands	No	PT/assistant	iPhone, ipad
9	20	GCSE and AS Level/ Access	West Midlands	No	None	iPhone
10	20	GCSE/Access	East Midlands	No	PT/assistant	iPhone, ipad
11	20	Access	West Midlands	No	None	iPhone, ipod
12	21	Access	Nottingham	Yes	None	iPhone, ipad
13	22	GCSE/Access	West Midlands	No	PT/HCA	iPhone
14	22	GCSE/Access	West Midlands	No	None	Android phone
15	23	GCSE/Access	East Midlands	No	PT/HCA	iPhone, ipad
16	24	BSc Psychology	East Midlands	No	Counsellor/ mother	iPhone, ipad
17	24	GCSE/Access	West Midlands	No	PT/HCA	Android phone, tablet
18	25	A level	West Midlands	No	PT/assistant	iPhone, ipad
19	26	Access	West Midlands	No	FT/PCSP officer	iPhone
20	27	Access	South West	Yes	PT/HCA	iPhone
21	27	Access	West Midlands	No	PT/ski dome	iPhone

22	28	Access	South West	Yes	PT/HCA	Android phone
23	28	Access	West Midlands	No	PT/PSCP officer	Android phone
24	29	Access	West Midlands	No	PT HCA/ Mother	iPhone
25	30	Access	East Midlands	Yes	Mother	iPhone, ipod
26	32	BA 2:1 PGCert Education	West Midlands	No	Teacher/Mother	iPhone, ipad
27	34	Access	West Midlands	No	PT/HCA	iPhone, ipad
28	34	Access	East Midlands	No	PT/HCA	iPhone, ipod
29	34	Access	West Midlands	No	PT HCA/ Mother	iPhone, ipad
30	35	Access	West Midlands	No	PT HCA/ Mother	Android phone
31	36	Access	West Midlands	No	PT/receptionist	Android phone
32	37	Access	West Midlands	Yes	PT HCA/ Mother	Android phone
33	38	GCSE/Access	West Midlands	No	PT HCA/ Mother	Android phone
34	40	BTECH/Access	West Midlands	No	Mother	Android phone

### 3.1.3 Data collection

Case study research typically includes multiple data collection techniques and data are collected from multiple sources (Yin, 2014) so strengthening the credibility of the outcomes. Data collection techniques included questionnaires, individual performance pre and post Objective Structure Clinical Examination (OSCE), individual semi-structured interviews and focus groups. Figure 3 illustrates the different data collection techniques used. The questionnaires were associated with the use of an Application specifically designed for use on a mobile device.

**Figure 3: Data collection methods**



Data was carried out in two main phases between December 2016 and March 2017 and June and July 2018.

### 3.1.4 Phase 1: Learning App and questionnaire

#### Objective Structured Clinical Examination (OSCE)

**Sub-Question: Does bespoke learning material have a place in mLearning?**

During the module students were expected to perform a 'skills drill' to check knowledge learnt through the App. The simulation exercises for managing the obstetric emergency took place in the simulation laboratory, a space familiar to the students and therefore non-threatening. The simulation sessions in the clinical laboratory assisted in the students learning the performance and dexterous manoeuvres involved when managing

a shoulder dystocia before being assessed by an OSCE. Participants were allowed to rehearse the clinical skills formatively and then after a period of six weeks had a summative OSCE against set criteria, which formed the documented data for the OSCE log. The OSCE marking criteria is available to view in Appendix 6. In total 34 OSCE logs were collated, saved and stored for analysis.

### **Sub-Question: What mobile devices do the learners have and what do they use them for?**

The survey questionnaire aimed to ascertain how many students owned a hand-held device and the type of device. This survey had multiple-choice and Likert-scale questions with options to support answers with a written justification if desired. The survey was an opportunity to gather broad demographic details of the participants such as age group and gender; data about what devices students had access to; perceived challenges of using mobile devices and levels of confidence in using technology enhanced learning tools. Questions were posed to determine the students' orientation to learning, in particular if they perceived themselves as being 'active learners'. A copy of the survey questionnaire is available as Appendix 7. Additionally the survey questionnaire explored the use of social networking with apps like Facebook or Twitter and the use of the shoulder dystocia App and its contribution to their learning. Both open and closed questions were asked, with space provided for free-text responses. As the 'space' for learning is an important feature of mobile learning it also served to gather information on the distance in miles that the student lived from the University.

A small pilot study was conducted with a volunteer sample of students (n=4) to test the questions within the survey questionnaire to ensure that they were unambiguous and met the needs of the research. This also gave opportunity to ensure that the instructions and wording for the consent to participate were clear and could be easily understood.

### **How the survey was distributed**

The application Bristol Online Survey (BOS) was used to host the survey questionnaires and participants were given access to a web link, which was left open for three months. As the research was being undertaken in my workplace and the participants were a convenience sample, I had access to the students' timetables and

therefore able to schedule a set time to speak with the students when attending university to explain the BOS and invite them to take part in this phase of the research study. The online questionnaire was delivered after their summative OSCE assessment with the distinct purpose of ascertaining their opinions on using the App.

### **3.1.5 Phase 2: Focus Groups and Semi-structured interviews**

#### **Sub-Question: What do learners perceive to be the benefits and challenges of mobile learning?**

A further set of qualitative data was generated through focus groups. For this phase of the research study the participants were accessed through the Course Director so that the timing was appropriate and convenient for them. I was given permission to access the students during a taught classroom session to introduce the aims of the focus groups, explain how it built upon phase 1 and phase 2 of my study and how it would further inform my research. This also gave me opportunity to gain expressions of interest for recruitment. The module leader encouraged participation and I was able to negotiate the set dates that the focus groups would be held and provide a schedule with date, time, duration and location for the focus groups at a time when they were required to attend university.

The intention was to plan for approximately five or six focus groups and stop when no additional data collection was likely to be generated, the idea of saturation, or when no more students came forward to participate. The literature suggests that the focus group size for focus should be no less than three participants and a maximum of ten or twelve (Williams et al 2006). From the cohort of student midwives twenty-four agreed to participate in the focus group phase of the research study so four focus groups were formed with six participants in each.

Consideration was given to appropriate privacy, organisation of the space in the room, comfort of chairs and layout of the room, as attention to these elements have the potential to impact on the success of the focus group (Patton 2002). Each focus group ran for approximately sixty minutes. To add rigor, objectivity, fairness, equity, and transparency I appointed an external verifier to assist with each phase of the study

and in particular the focus groups. The external verifier was a senior lecturer in the department in which I worked but external to the midwifery team. My role in the focus groups was to gain informed consent from the participants, inform them about the objectives of the focus group, introduce the discussion topic, engage the students to be active participants and elicit the views and/or perceptions of the participants in relation to the subject (Appendix 8 guidance for focus group). Field notes were created directly after each focus group to ensure that the detail of the group, any particular anomalies could be recorded to aid my reflection at the later stage of analysis. Data from the focus group was captured with participant consent on a recording device and discussion board (graffiti wall) and was later transcribed verbatim for analysis.

### **Sub-Question: What mobile devices do the learners have and what do they use them for?**

Student midwives are central to this study and in order to understand how, why and what they learn by using mobile technology it was essential to hear the student 'voice'. Time had elapsed between phases one and two 1 of the study and the student midwives were in their third year of the midwifery programme. Enthusiastic to retain their involvement and retain the student cohort as the 'bounded case' the cohort were contacted again and invited to be involved in the final phase. A call for expression of interest via the students programme web platform and student email generated a total of eight responses. Whilst the numbers of participants were dwindling I recognized that the timing of phase 2 coincided with the student midwives programme gaining momentum and that they were required to be in clinical placement full time resulting in them having less time attending university. However, I believed that eight participants were broadly representative. The power of interviews in research cannot be underestimated, as it is an opportunity to capture the real life-world of the interviewee in respect of the phenomena (Cohen et al, 2007). The semi-structured interview enabled human interaction between the researcher and the participants in a unique way revealing a deeper understanding of the interviewees' thoughts, feelings, perceptions and attitudes towards mobile technology (Robson, 2011). Flexibility is a key feature of semi-structured interviews (Denscombe, 2010) and although a question schedule had been developed,

scope was given to allow the interviewee to develop their own ideas and speak openly and widely on the use of mobile technology.

On receipt of an email informing of their interest to be involved each respondent was provided with a date, time and venue for the semi-structured interview and a copy of the questions to expect was sent as an email attachment for them to review before attending. This was considered essential to give time for the participant to focus on the questions that would be asked and reduce any anxiety they may have had. A copy of the semi-structured interview format is available as Appendix 9.

The semi-structured interviews were held in a small, comfortable, private interview room located in a research centre at my place workplace as this provided a space with less risk of interruption. Each semi-structured interview was scheduled for 60 minutes and conducted on a one to one, face-to-face basis. The schedule spanned a two-month period to allow participants sufficient notice to organize their clinical placement and allow for a mutually convenient time. At the start of each semi-structured interview consent was obtained which included consent to the use of a digital recording device to capture the discussion. Field notes were taken during the semi-structured interview but this was kept to a minimum so that I was an active listener engaging with each participant. A written transcript was made available for each participant so that they could verify it as a true record and reflection of the semi-structured interview. To date no student has requested to follow this up but the record will be kept for up to one year following completion of this study and then destroyed.

### **3.2 Analysis and reporting the study**

In order to use qualitative data to provide illumination and expansion of quantitative findings each type of data was kept analytically distinct using techniques usually associated with that type of data, for example, statistical techniques were used to analyse assessment scores from the OSCE whilst thematic analysis was used to analyse the interview data. Thus both sets were analysed independently but brought together in the findings section in order to offer a seamless integration.

Thematic analysis (TA) was chosen as the strategy for identifying, analyzing and reporting patterns (themes) within the open-ended responses from the survey questionnaire, focus groups and transcribed semi-structured interviews. The transparency of the method ensures confidence in the findings (Braun and Clarke, 2006). The process of thematic analysis can be outlined in five steps; compiling, disassembling, reassembling, interpreting and concluding (Yin, 2011). There are several different ways to approach thematic analysis (Alhojailan 2012, Javadi and Zarea, 2016) but for the purpose of this thesis a combination of Yin's (2011) five-phased cycle and Braun and Clarke's (2006) 6-step framework has been used as each permits flexibility to move forward and backwards between the steps when necessary forming an iterative relationship with the data.

The multiple methods of data sources generated a vast amount of data. In order to provide a comprehensive organisation triangulation methods were used (Carter et al, 2014). The data analysis culminated in addressing and answering the research question, *how do learners make use of mobile technology and with what consequences*. Patton (1999) identified four types of triangulation: method triangulation; investigator triangulation; theory triangulation and data source triangulation. Combining individual semi-structured interviews and focus group data enhanced the richness of the data. Triangulation contributed to knowledge production and synthesis of the main contributions to the phenomena from these methods of data collection.

### **3.2.1 Objective Structured Clinical Examination (OSCE)**

The use of the App was integral to the survey questionnaire pre-test and post-test. As the use of the shoulder dystocia App was introduced during a taught module focusing on obstetric emergencies which involved high fidelity simulation of the manoeuvres involved in managing a shoulder dystocia I was aware that it would be difficult to establish that the learning outcomes and post-test scores in the OSCE assessment were as a result of the intervention (using the shoulder dystocia app). It was always the intention that the shoulder dystocia App would complement the traditional teaching method of simulation and skills drill so as not to disadvantage the participants or inhibit their learning, knowledge and skill acquisition. It has been highlighted by Cook and Beckman (2010) that pre-tests can be seen as a threat to study design as the participants

become familiar with post-test questions, stimulate learning and heighten awareness of the assessment requirements. I would argue that in this research study the pre-test was an integral part of the intervention and the participants being aware of their scores in the formative OSCE served as a motivator for learning.

Pre-test and post-test study designs are widely used across a range of scientific and educational disciplines, as they fundamentally compare and/or measure a change resulting from an intervention. In this research study the two measurements recorded are made with the same assessment tool with the pre-test score being made prior to the use of the shoulder dystocia app (intervention) and the post-test score after a period of time using the intervention. It was expected that a majority of the students would, after using the App, improve their scores and gain confidence in managing and performing the skills drill in the post-test summative OSCE. Table 11 captures a snapshot of the pre-test and post-test results from this cohort.

**Table 11- Pre-test and post-test results from using the App as reported by OSCE results**

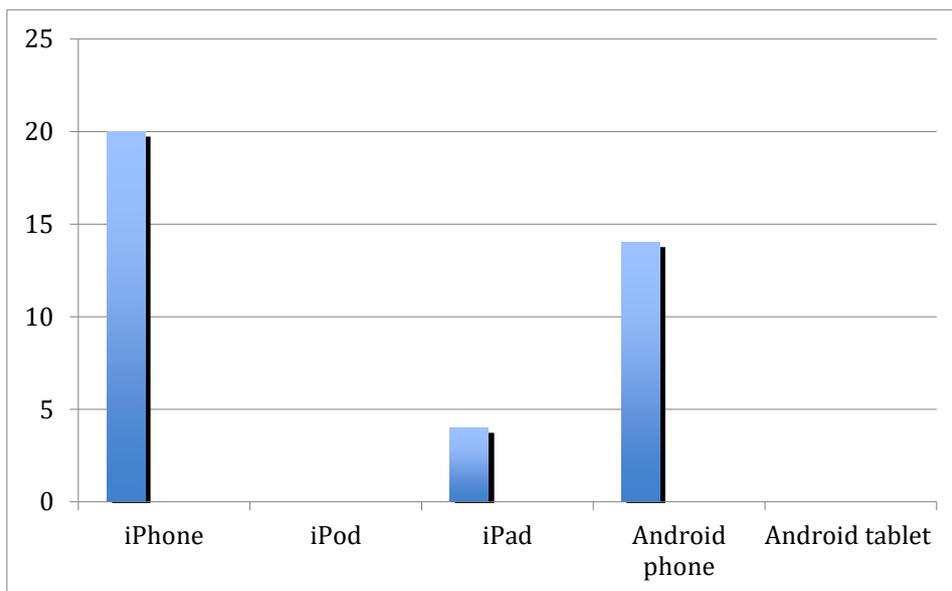
<u>Participant Identification</u>	<u>Pre-test measurement in %</u>	<u>Post-test measurement in %</u>	<u>Participant Identification</u>	<u>Pre-test measurement in %</u>	<u>Post-test measurement in %</u>
1D	68	72	21 D	62	75
2 D	72	80	22 D	46	59
3 D	54	62	23 D	42	62
4 D	38	54	24 D	61	73
5 D	65	81	25 D	55	68
6 D	90	93	26 D	66	75

Analysis of data collected from the students' use of the App threw light on the value of mobile learning. I had hoped to access user activity and the App, for example which resources the learner used in the App, how often each learner accessed the App and which resource was most frequently visited, but this was archived by Apple, and I was unable to access these data. Access to this data would have illustrated.

### 3.2.2 Survey Questionnaires

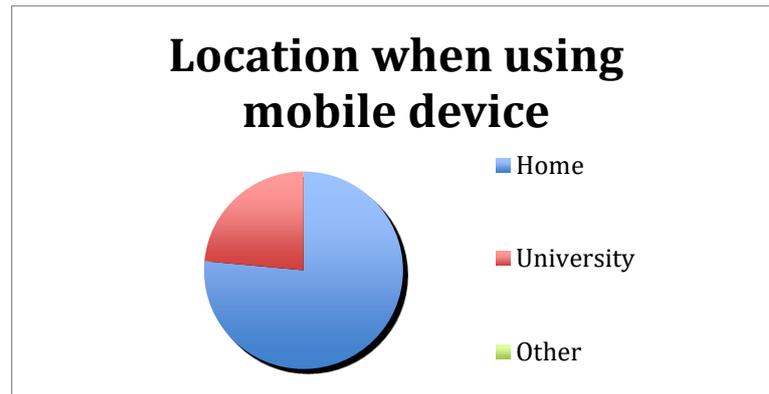
The survey questionnaire was designed in three distinct sections with the first section focused on the type of device held by the participant, how they used the device for communication and technical aspects such as connectivity to the Internet. Section two was directly related to the use of the shoulder dystocia app with the third section exploring participants' perception of their personal learning with mobile technology. There was a 100% response rate for the survey questionnaire. The online survey tool exported the data into a portable document file (PDF) for download and generated tables for each response. The example below shows the type of mobile device owned by the participant. It is clear to see that the majority of respondents at that time had a preference to own an iPhone (Table 12).

**Table 12 - Type of mobile device owned by students in the study**



Responses to each question were retrieved in a format that could be used to generate a range of tables or charts. The chart below (figure 4) illustrates that the majority of students used their mobile device when at home to access teaching materials. For reasons of space I did not include these charts in the final report.

Figure 4



### 3.2.3 Focus Groups

Each focus group was 60 minutes in duration yielding four hours of audio recording that was listened to several times and transcribed verbatim for analysis. Sutton and Austin (2015) recommend that although time consuming it is better that researchers undertake the transcription themselves, as they will become more immersed in the data and acquire a sense of the entirety of the data. Again, by employing thematic analysis a deep understanding of the data and the perspectives of the students' relationship with mobile devices started to crystallise. Descriptive codes were used to identify topics from the data, such as, type of device, location, Apps, social networking and a tally record made identifying the frequencies of the relevant themes within the transcript. Moving through the initial stages of thematic analysis and returning to field notes early impressions from the data was captured. Below is a sample extract from the focus groups:

Early notes from the focus group included:

*Students are engaged with the App, they are busy talking about how it helps to guide what they need to know. They find it easy to follow the nibbs/icons and appear to be moving seamlessly forward and backwards to different material. Links are being made with the video, details of animation to show exactly what is happening internally with the baby at the same time as they move their hands and perform internal rotations manoeuvres. Impression 1: students are being active learners, impression 2: they appear to be enjoying the video and animations in the App, impression 3: they are linking*

*what they have been taught in the skills laboratory and simulation with they can now see and experience with the App.*

Across all the data the refinement of the themes enabled consideration to sub-themes and how these related to each other and the questions driving the research.

### **3.2.4 Semi-structured interviews**

In total eight recorded semi-structured interviews accumulating to over eight hours of audio recording were carefully transcribed verbatim ready for analysis. Each audio recording was listened to repeatedly and the transcriptions were read over and over again. Each transcription was given an Identification code, for example student 1 – ‘T’ to student 8 –‘T’ so that the data was clearly identifiable as being related to the semi-structured interview. For each transcript thematic analysis assisted in reducing the data into workable themes and from this emerging conclusions were made. Emphasis on the voice of the participants was important so *in vivo coding* was used for verbatim words and short phrases from the participants’ narrative. This is sometimes referred to as verbatim coding, literal coding and natural coding and praised for its reliance on the participants themselves for giving meaning to the data (Saldana, 2016). As I was working alone I had to be address intra-coder reliability, I compared and contrasted test coding with my supervisor using the same coding schedule, and a high level of consistency was achieved. Where inconsistencies had emerged I changed the code names to clarify their meaning. All material and evidence was treated fairly to produce analytic conclusions from the original research questions. The final stages of thematic analysis involved interpreting the data and making conclusions from the data in relation to the research questions and investigation of this study. During the reassembling phase care was taken, as suggested by Anderson (2011) to ensure that the story of the data unfolded thus avoiding arranging the data to support the research questions and my own theory.

Reading the transcripts and revising field notes allowed me to become familiar with the entire body of data. Early impressions were recorded at this stage. Below is an example of some early notes made on a response from the interview:

*The students seem to be focused on the use of their mobile devices for social networking, and reluctantly make a connection between using it as a tool for learning and gaining appropriate*

*knowledge. The students are very clear about the type of social platforms that they access, why and that everyone is 'posting' messages late at night. There is no 'cut off' as they send a message and get an instant response—for some this is after midnight and they are still sending messages. There is some type of inherent cultural practice between the immediacy and demands for individuals to respond— is this a fear of missing out? Is this a level of self-gratification? Or is it that they are just busy and have to respond to 'get another things off the list'? The connectivity, immediacy and pervasiveness nature is important.*

The second phase, involved disassembling and breaking down the compiled data into fragments and returning to them frequently. For this I had electronic files and also used post it notes and different charts to move the segments around until satisfied that the data matched the correct code. The research questions were not used for the coding, but were helpful when trying to be systematic. Codes were given by colour and abbreviations on electronic files and hand written notes. Working through segments of data I searched for common words, and comments. For example, only using messaging for communication instead of text or phone call was repeated throughout the focus groups, semi-structured interviews and survey. Preliminary codes were used and later modified across the data. The whole process was recursive as the constant reviewing for patterns confirmed and defined the emerging themes from the data sets (Yin, 2011). Following this the third step involved searching for repetitive terms, each considered for their significance to the research questions. The entire process occurred over an extended period of months enabling me to become familiar with the data, refine codes, and search for emerging themes. Steps four and five of thematic analysis, reviewing the themes and defining them helped when examining the codes and matching them with a theme. However, there was considerable overlap between the stages in these stages in this process. For some researchers the use of specially designed computer software is desirable but I chose not to be encumbered by learning the software and to have the freedom to understand the data and consider rigor. As suggested by Yin (2011) the rigor of the data was maintained by the constant checking and rechecking of codes and labels in the fragments, the accuracy of the data, thorough analysis and the acknowledgement of bias.

Table 13 shows a snapshot of the preliminary themes identified from the semi-structured interview in relation to perceived benefits of using mobile device.

Table 13 – Sample showing preliminary assignment of themes

Participant	Dialogue from participant from semi-structured interviews		
P1	<p>Being contactable at all times</p> <p>The calendar facility – keep organized for me and the family</p> <p>Can be used anytime, anyplace with Wi-Fi</p> <p>Connection</p> <p>Not having the Internet access</p> <p>Memory capacity on the device – not enough</p> <p>Small screen size.</p>	<p>Learning how to use the device to get the best out of each function</p> <p>Updates and the length of time it takes</p> <p>No Internet access</p> <p>Quick to use up storage</p>	<p>Poor, unpredictable Internet connection.</p> <p>Have to have the device with me at all times</p> <p>Not having that face to face interaction, not having the teaching or teacher contact to explain things that you do not understand.</p> <p>Organisation, I use an app called My duty for managing everything.</p>
P3	<p>Staying connected at all times in all places.</p> <p>It is great and instinctive I might want to look up a condition or term and I put it into Google with the incorrect spelling and somehow Google just knows the term that I am looking for and knows what I am trying to spell so it is great.</p>	<p>The screen size. I need to have a larger screen to work with.</p> <p>Charging time,</p> <p>constantly looking for right leads to charge each device</p> <p>Updates, constant updates and pop up messages</p>	<p>Battery charge, when this does fail and needs charging then I do find it challenging as I need my phone to live.</p> <p>Having an up to date calendar or timetable</p>
P4	<p>The best thing for me is that it keeps me connected to friends, family and what's going on in the world. Family and friends contact me all the time.</p> <p>I can use it anytime, anyplace</p> <p>Battery life, seeing what I can achieve in the time I have for the battery.</p>	<p>I don't print anything anymore I just put everything into the phone. If my phone went flat then everything would be lost all in one go as everything is digital, banking, driving licence etc.</p> <p>Loss of Connection to Internet and need to updates</p>	<p>Limited or no Wi-Fi access</p> <p>Access to learning materials at anytime Connected and contactable at all times</p> <p>using the device for revision</p> <p>Lack of knowledge on how to use the device for accessing learning materials</p>
P5	<p>Keeps you connected</p> <p>Can be used at anytime, anyplace</p>	<p>No connection to Internet</p> <p>Dependency on having the device</p>	<p>Ability to use the device, I don't think I use it to its best potential. Would like</p>

	<p>with <b>Wi-Fi</b> connection. Stay <b>contactable</b>.</p> <p>Staying <b>connected</b> at all times.</p> <p>I use in <b>anytime, everywhere</b> I am.</p> <p>Updates Switch to battery saving mode and avoid the use of Snapchat when on battery saving mode.</p>	<p>with me all the time, just in case someone needs me.</p> <p>Pay £40.00 a month to use a connected device!</p> <p><b>Small screen</b> and <b>updaets</b></p> <p>I can get easily distracted by pop up messages.</p> <p>Access to learning materials at <b>anytime Connected and contactable</b> at all times using the device</p>	<p>to know what apps I can use to help me organsie myself and my life.</p> <p>Access to learning materials at <b>anytime Connected and contactable</b> at all times using the device for revision</p>
<b>Colour Codes</b>	<p><b>Connection/communication</b></p> <p>Function</p>	<p><b>anytime, everywhere</b></p> <p><b>Internet connection</b></p>	<p><b>contactable</b></p>

The descriptive nature of the qualitative approach in this thesis allows the case to unfold building the complex, holistic landscape of how learners (student midwives in this case) make use of mobile technology with associated benefits and consequences within their natural setting.

### 3.3 Chapter summary

This chapter has presented the bounded case study, research design and methodology and methods of the thesis. The epistemological, ontology and axiology of this research study have been stated with the dominance of both interpretivism and social constructionism paradigms. Ethical considerations underpinning the study have been presented within a general context and in relation to each data collection method. The bounded case of student midwives interaction with a specially designed App related to managing an obstetric emergency, namely a shoulder dystocia heightens awareness of how students use digital technologies for learning.

The mixed method approach, the study used both qualitative and quantitative data, was driven by the nature of the research questions. Knowledge, skill and performance of managing an obstetric emergency in the safe environment of a clinical skills laboratory was evaluated via pre and posttest. The survey Questionnaires yielded a 100% response rate from all participants. The focus groups and semi-structured interviews captured the

voice of most of the student midwives and what they perceived to be the benefits and challenges of mobile learning.

Thematic analysis (TA) was the chosen data analysis strategy, as the method of identifying, analyzing and reporting patterns (themes) within the data. The subject of mobile learning is dependent upon a variety of facets and the data captured within the research exposed the complexities of the phenomenon. Triangulation contributed to knowledge production and synthesis of the main contributions to the phenomena from these methods of data collection.

### Summary points

- A bounded case study using a mixed method approach with both qualitative and quantitative research design methods.
- The bounded case of student midwives interaction with a specially designed App related to managing an obstetric emergency, namely a shoulder dystocia heightens awareness of how students use digital technologies for learning.
- The quantitative data collection methods answered '*how many*' students owned a hand-held device, the type of device and the frequency (*how much*) by which they used a mobile device for learning.
- The qualitative methods aimed to understand the experience and attitudes of the learner towards mobile learning and answered the '*what*' students used the hand held devices for in relation to learning, '*how*' they used the device and '*why*' they chose to use it over another tool.
- Triangulation methods were used to test validity through the convergence of the information from the different sources.

## 4.0 CHAPTER 4 - FINDINGS

### 4.0 Introduction

This chapter reports the findings from the various data collection methods: OSCE; survey; focus groups and face-to-face semi-structured interviews to reveal the students' experience of, attitudes to, and perspectives on mobile learning. The findings from each method of data collection is presented and themes that emerged from the triangulation of the findings are indicated: communication; organization; recreation; connectivity; access and ease of use; learning on the go; immersion in technology; challenges and behaviour and engaging the learner. The data reveals the perceived challenges with mobile technology and assists in answering how learners make use of mobile technology and with what consequences.

This chapter is divided into four sections with section 4.1 reporting on data from the pre-test and post-test Objective Structured Clinical Examination (OSCE). Section 4.2 addresses the survey/questionnaire and reports how students perceived mobile learning when using the bespoke learning App. The types of device owned by the students is also shown alongside the primary uses for their mobile devices. The themes of access and use of technology; communication and organization are shown across these first two sections. Section 4.3 shows the data from both the focus groups and semi-structured interviews. These two data sets have been combined due to their similarity and in an attempt to avoid repetition. This section shows the importance of learners give to being constantly connected with their world. It explores how the students have become reliant upon the use of mobile technology for communication through social media platforms. It begins to consider the consequences of using mobile technology leading to a level of dependency on the mobile device and the immersive use of technology.

Conclusions are presented in section 4.4 with a summary of the key findings from the data and the influence mobile learning can have on promoting a richer, interactive learning experience for students is shown.

#### 4.1 Findings: Learning with bespoke App and OSCE

As mobile technology continues to change and new trends emerge the use of specific applications and technologies for learning aimed at supporting student engagement within their learning environment have become more common. The specifically designed Shoulder Dystocia App was aimed at promoting interaction with learning materials to enhance the learners understanding of the complex management of a 'obstetric emergency'. The App was used in conjunction with classroom simulation so that the learner could have additional support when practising the skills needed for managing an emergency. Designed to prepare the student midwife for clinical practice, the assessment of skill performance was undertaken with an Objective Structured Clinical Examination (OSCE). This was carried out before using the shoulder dystocia App as a pre-test OSCE and again after six weeks of using the App as a post-test OSCE to measure performance and to see if using the material built into the App had aided the student's learning. The results from the OSCE were positive with all areas of performance seeing a marked improvement following use of the App. Table 14 is a summary of the overall performance and results of the OSCE before and following usage of the App.

**Table 14 Summary of data from pre-test and post-test OSCE**

Summary Statistics	Pre-test OSCE	Post-test OSCE
Total number of students	34	34
Total number of passes	28 (84.64%)	33 (92.86%)
Total number of fails	6 (15.36%)	1 (7.14%)
Total number of deferrals	0	0
Average mark/grade	56.45	64.85
Standard deviation	14.39	12.74

The main finding from the pre-test OSCE was that six students failed but in the post-test OSCE only one student failed. There was a rise in the average grades achieved rising from 56.45% to 64.85% following use of the App. Alongside this, the data from each

area of the marking criteria in the OSCE attributed to the rise seen in the average mark attained.

It is difficult to distinguish if the increased success rate in the number of students passing and rise in performance, is from the use of the App alone and how much the rehearsal of the skill through simulation in the skills laboratories contributed. As outlined in chapter 3 (methodology), contained within the shoulder dystocia App were bespoke lecture recordings, video files, an authentic re-enactment of the skills drill, self-test quiz area and links to the Internet and recommended reading. It is unclear as to whether or not the students accessed other sources of information to aid their learning in preparation for the access such as textbooks, online platforms or guidelines.

In an attempt to assess if the introduction of the App contributed to the increase in assessment grades the performance of the students in this study were then compared to the module statistics from the previous academic year when students did not have access to the shoulder dystocia App to aid learning. Table 15 illustrates the module statistics for the previous academic year and suggests that the App may have well made a contribution to reducing the number of fails.

**Table 15 Summary of module outcomes for Cohort (2016/2017) with no access to the shoulder dystocia App.**

Summary Statistics	Summative OSCE
Total number of students	34
Total number of passes	29 (87.20%)
Total number of fails	5 (12.80%)
Total number of deferrals	0
Average mark/grade	58.75
Standard deviation	12.29

The marking criterion for the OSCE was divided into ten discrete sections that reflected the key manoeuvres required for the management of a shoulder dystocia. Seven of the components were directly related to skill acquisition and dexterity of movements with the remaining three being knowledge based. From table 16 the average mark attained in the OSCE assessment had improved so it was important to see where the increase in

marks had taken place. The table below illustrates the average score for each of the components. The sections shaded are labeled with the letter 'K' indicating knowledge acquisition and those not shaded have been labeled 'P' representing performance of the clinical skill.

**Table 16 Distribution of marks across each of the assessment criterion in the OSCE**

Criterion	Pre-test average mark	Post-test average mark	Mean difference
<b>(K) Risk factors for shoulder dystocia</b>	30%	50%	20%
<b>(P) Management of shoulder dystocia (HELPERR) Help (H) (P)</b>	40%	60%	20%
<b>(P) Evaluate / Episiotomy (E)</b>	40%	60%	20%
<b>(P) Legs (L)</b>	60%	80%	20%
<b>(P) Pressure (P)</b>	60%	90%	30%
<b>(P) Enter the pelvis (E)</b>	40%	67%	27%
<b>(P) Removal of the posterior arm (R)</b>	30%	50%	20%
<b>(P) Alternative positions</b>	40%	60%	20%
<b>(K) Documentation and debriefing</b>	60%	80%	20%
<b>(K) Complications</b>	50%	60%	10%

<b>associated with shoulder dystocia</b>			
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Improvement was seen across all criteria in the marking grid with most improvement seen in two skills based performances; ‘pressure’ and ‘enter the pelvis’, and the lowest improvement in knowledge around ‘complications associated with shoulder dystocia’. The modal difference was 20%. The higher attainment and improvement in marks had been seen in the skills performed when internal manoeuvres had to be explained and demonstrated. For this type of OSCE high fidelity equipment is used to demonstrate the required manoeuvres and aid simulation. Using a specially designed manakin and a doll students were expected to provide a detailed, cohesive rationale and explanation of each manoeuvre. In a real life situation the operator is unable to see what they are doing as the majority of manoeuvres are internal. Manual dexterity is required and accurate knowledge of anatomy and physiology essential in order to provide a full explanation of angles at key bony prominences and knowledge of how angles of inclination can impact on the fetal axis to facilitate movement and delivery of the baby. The findings here suggest that the specialized 3D animation and images that were created for the App enabled the student to see the internal manoeuvres and exactly where the operator should place their fingers and the direction in which the rotation of the fetal head, shoulders and body should be at any given time to aid delivery.

At this stage of midwifery training the students had been exposed to the clinical areas and more than likely involved in the management of an obstetric emergency but not necessarily a shoulder dystocia. The first section in the marking matrix required them to articulate the risk factors associated with shoulder dystocia. The average score across the cohort pre-test in this area was 3 marks out of 10 rising to 6 marks in the post-test following the use of the App. In order to manage the obstetric emergency appropriately the operator has to be able detect the signs early, deal with and coordinate a set of events which are dictated through a sequence of manoeuvres, each within a specified time to ensure optimal outcomes for both the mother and the baby. The improvement in grades achieved in the post-test OSCE are encouraging as the ‘skills drill’ and ‘lecture recordings’ embedded within the shoulder dystocia App were designed to reinforce the HELPER mnemonic, used to aid memory recall and trigger the correct sequence of

events expected when managing a shoulder dystocia in either a simulated or real life exercise.

The students in this study also demonstrated areas of improvement in knowing the sequence for promptly changing the maternal position. Using a specially designed manikin students were expected to provide a detailed rationale, explaining the benefits of placing the mother into the McRoberts position to aid delivery of the baby. The majority of students performed to a high standard during both the pre-test and post-test OSCE with a significant rise in marks from 9 out of 15 to 12 out of 15 in this element. However, it remains unclear if the rehearsal through simulation contributed to this increase in marks or if it was the App or a combination of all teaching methods and tools.

As regards student feedback on using the App this was captured in the survey. The data revealed that all of the students found the information contained within the App and the sequence of the icons useful when preparing for their OSCE. They reported that the App was easy to navigate and that the video files within the App authentically and accurately reflected the skills drill and contributed to their increase confidence and knowledge in the management of a shoulder dystocia. All of the students commented positively that the App allowed them to repeatedly review the sequence of movements required for the position of the baby and the angles of rotation required to reduce what is known as the bisacromial diameter, aiding descent into the outlet for delivery. Following access to the bespoke shoulder dystocia App, 94% of students indicated that would like to have more Apps available for learning the management of all obstetric emergencies.

## **4.2 Findings: Survey questionnaire**

The survey consisted of twenty-six questions. The questions were both open and closed, with a selection of multiple-choice and Likert-scale questions with space provided for free-text responses. The survey was divided into three sections; one with questions related to communication and technical aspects of using mobile devices, a second related to the use of the specifically designed App, and the third and final section related to personal learning with mobile technology. The data from the survey has been integrated

around the themes of: access and use of technology; communication; organization and recreation. The survey questionnaire was emailed as a link distributed via an online survey tool (Bristol online Survey, BOS), which was launched at the start of the module to all student midwives from the Cohort (n=34).

The survey was completed by all of the student midwives and yielded a 100% uptake. This may be attributed to the student midwives being keen to engage with the research, especially as they perceived that they would benefit from the use of the App and improve their knowledge and performance with a 100% uptake and completion. The survey was available for eight weeks. The use of this online survey tool enabled one inbuilt reminder to be sent to the student to complete the survey from the launch date to the end date of the survey. The benefits of using the BOS survey tool were easy extraction of the data and compilation of tables ready for extraction. Coding was applied to the data and this enabled the organisation and extraction of key themes from the survey: type of device; activities and use of mobile device; importance of being connected with others.

#### 4.2.1 Theme: Access and types of device

The survey set out to provide a picture of what mobile devices student owned, what they used them for, and how, if at all, these uses supported or influenced their learning. The study revealed that all students (34) owned an Internet enabled mobile device in the form of a smart phone or tablet. The choice of device ranged between iPhone, iPad, iPod, android phone or an android tablet as seen in Table 17.

**Table 17 Make of device owned by students (n>34 as some students own more than one device)**

Type of Device	iPhone	iPad	iPod	Android phone	Android tablet
Number of Students	24 (71%)	12 (35%)	4 (12%)	10 (29%)	1 (2%)

In total twenty-four students indicated that they owned an iPhone (71%). Of these, twelve indicated that they also owned an iPad (50%) and four owned an iPod (16%). Apple devices were the most popular choice of device in this group of students, as only ten (29%) students owned an android phone and one of these students owned both an android phone and android tablet. It is very probable that the choice of device was due to prestige, function and status. If it were down to cost alone then all students would own the basic smartphone, which is an android device available at a much-reduced cost when compared to an Apple device. The marketing of Apple devices is not only about function and technical specifications but 'slick', 'aesthetically appealing', 'slender', 'shiny gadgetry'. Branding is a powerful tool and closely linked to the social or economic status of their owners. The iPhone has arguably become the iconic smartphone, a fashion statement and symbol of wealth and with this also the most expensive on the market. It is possible that not everyone was interested in owning the latest iPhone and the android owners are satisfied that the cheaper smartphone device performs the functions they require and is good enough.

#### **4.2.2 Theme: Use of technology (mobile devices)**

Now that we know the type of devices owned by the students the focus turns towards what is the purpose of their use. The findings across all data sets show that there was a wide and varied range of activities undertaken with mobile devices. In analyzing the data from the survey, focus groups and semi-structured interviews, students indicated the most frequently cited type of activities for using their mobile device and these activities were categorised as: communication; organising functions and recreation. Table 18 outlines each category and the type of activity.

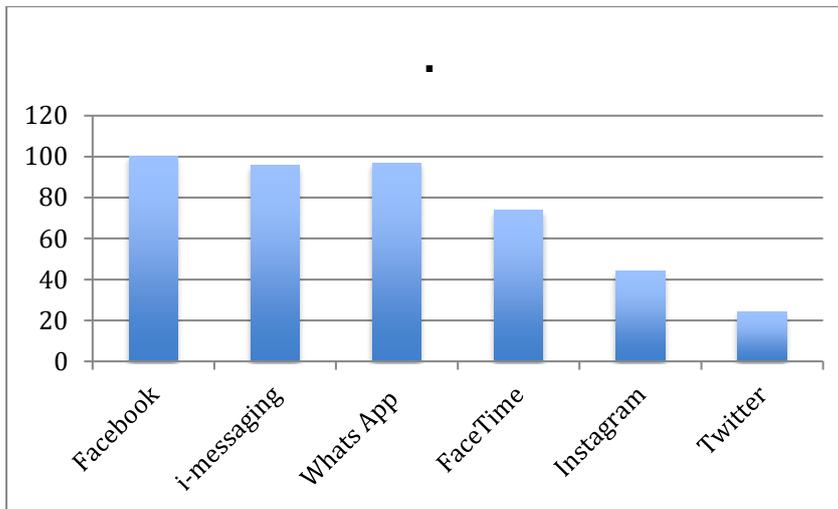
**Table 18 Type of activity with mobile device by category**

Category	Communication	Organisation and functions	Recreational
Type of Activity	Social media & Apps i-messaging Text messaging Accessing email	Shopping Browsing/ searching for information Personal online banking Receiving news alerts Weather reports Setting alarms Calculator Notes Learning – theory Learning – clinical skills	Shopping Listening to music Watching videos Reading (e books and articles) Uploading/ streaming content Playing games Camera function / photographs

### 4.2.3 Theme: Communication and Social use

Students explained that mobile devices such as smart phones were mainly used for social networking through social media sites and applications (Apps) and formed an essential part of their communication. Although mobile devices had the function of telephony the students indicated that specific Apps were used for the purpose of communication and social networking. The most popular Apps were: Facebook (100%); WhatsApp (97%) and i-messaging (96%) and these along with other forms of social media are presented in the Table 19.

**Table 19 Types and use of social media Apps by students**



Facebook and WhatsApp Messenger were the most popular choices for communication. This was expected, as both are freeware, cross-platform messaging services available across both iPhone and android devices. These applications are free to use permitting users' unlimited access and ability to connect with friends online locally, nationally and internationally. Respondents favoured these Apps, as they were not reliant upon a mobile network but an Internet or Wi-Fi connection.

The current four most popular social media platforms in the United Kingdom (UK) are: Facebook; Twitter; YouTube and Instagram but while all students used Facebook they reported lower use of the three other applications with only 44% of students using Instagram, 25% making use of Twitter and no one highlighted the use of YouTube. However 29% of students shared that they used Snapchat as a messaging application to share photos, videos and text. They also indicated that Snapchat was used for 'fun' to have 'live' interaction with each other from different locations. It is highly likely that Snapchat will grow in popularity as the developers have changed the way in which it functions and are focusing on 'instant communication' and broadcasting 'your story' with your friends and 'followers'.

The findings of this research further revealed that activities such as: i-messaging (96%); accessing email (92%); and text messaging (65%) had replaced the need for a landline or to have verbal interaction with other. Only 9% of students in this study

identified that they used Skype for communication. Skype is a diverse package, which is usually built into Microsoft email accounts. Skype is associated with business rather than social networking and that may contribute to its unpopularity.

#### **4.2.4 Theme: Organisation, function and recreation**

The majority of students used their mobile devices for organising daily function, which mostly involved browsing and searching the Internet. Nearly all students indicated that they used their mobile device to shop online and here they separated the function of shopping for essential items such as food from shopping for recreation. Personal online banking was widely used followed by keeping updated by receiving news alerts. Other useful functions cited included using the mobile device as a calendar, using Apps to set alarms and notifications, organize coursework submission dates, placement days and social events. The calculator was seen as being essential as was an App for taking notes.

Likert Scale responses indicated that students saw mobile technologies as encouraging them to be independent learners. In total 97 percent of students strongly agreed that mobile learning afforded flexibility in time and place of learning. This was echoed with the findings from the focus groups and the semi-structured interviews in section 4.3. In relation to learning with a mobile device the majority of students (85%) indicated that the use of mobile technology accommodated their individual diversity and met their personal learning styles. Table 20 illustrates the sum of responses concerning mobile learning statements collated from the survey data. When asked if mobile learning had encouraged students to reflect on their learning material 41% indicated that it had, but for 59% of the cohort the mobile device was not perceived as a tool for reflection.

**Table 20 Sum of responses concerning statements about mobile learning**

The Likert Scale was as follows: 1 = Strongly disagree, 2 = Disagree, 3 = neither disagree nor agree, 4 = Agree and 5 = Strongly agree.

		☹				☺	<b>Overall Percentage of 4 and above</b>
<b>Statement</b>	<b>score</b>	1	2	3	4	5	
Mobile learning has encouraged me to reflect on the learning material		5	15	-	10	4	41%
Mobile learning has encouraged my ability to be an independent learner		-	3	-	19	12	91%
Mobile learning affords flexibility in time and place of learning		-	1	-	8	25	97%
Mobile learning has accommodated my individual diversity and learning style		-	2	3	10	19	85%
Mobile learning and the mobile learning device has sustained my interest in learning		-	4	2	11	17	82%
I would take the opportunity to learn other skills supported by a mobile learning device		-	1	1	11	21	94%

The results were encouraging, as the majority of students indicated that mobile learning and the use of their devices had sustained their interest in learning. Another

positive outcome in relation to mobile learning was that 94% of students would embrace the opportunity to learn material supported by a mobile learning device.

The survey did not restrict the students' response when asked what they used their mobile devices for and responses show that students used mobile technologies to meet the differing and demanding needs of their lifestyles. In addition to the purposes of communication and organising, the table in section 4.2.2 shows that students used their mobile technology recreational purposes. Browsing the Internet was second nature when: comparing prices; ordering food as a takeaway; booking restaurants; streaming music; listening to music playlists; taking photographs; watching video material; playing games; reading articles and e-books. Table 21 illustrates these uses and show that general browsing (by which they meant searching popular websites, ad hoc viewing of material without an initial specific purpose) was the most popular activity.

**Table 21 Recreational use of mobile devices (percentage of respondents indicating they undertook certain activities)**

Activity	Browsing	Shopping	Listening to Music	Viewing Video	Reading	Ordering Food	Taking Photos	Playing Games
Number of responses	34	32	31	28	25	24	23	16
Overall %	100%	94%	91%	82%	74%	71%	68%	47%

### 4.3 Findings: Focus groups and Semi-structured interviews

As seen in the methodology section all students were invited to participate in a focus group to share their views and experiences on the use and role of mobile learning and mobile technologies in education and later eight students participated in semi-structured interviews. The data from the focus groups and semi-structured interviews have been integrated around the themes of: communication; organization; recreation; connectivity;

access and use of technology; learning on the go; immersion in technology; challenges and behavior and engaging the learner.

### 4.3.1 Theme: Access and social use of Technology

Mobile technology was seen as fundamental to daily life for the majority of the students and they were clear about what Apps they used, why and when they used them,

*I use Facebook, WhatsApp for group chats. I use i-message a lot, texting is kind of dwindling off now, and no one I know uses text. I primarily use WhatsApp for communicating, you can call for free so we pretty much have everyone on it so that we can all chat or message and it is fun. (SS15)*

The marketing and branding of social media apps had a strong influence over its prevalence. The use of a mobile device was viewed as essential for every day function and communication. Commentary within the data suggests that the majority of students were never without their device. As stated by one,

*my device is with me all the time and I use it for everything. I use it for messaging, Facebook, Twitter. Texting is old school so I don't tend to text but mainly use messaging through WhatsApp to communicate to everyone. (SSI8)*

The data captures the change in communication style and showed that the onus was no longer on being able to speak to someone in person. This is seen from the perspective of the students in the following comments that,

*texting is old school, so I use messaging through WhatsApp to communicate to everyone. (FG1)*

and in another,

*I suppose taking the time to speak verbally is more of a bind these days as it is quicker to message, and you get an instant response, or you know that later when people have the time to look at their messages in the evening they will respond. (SSI5)*

Another chosen method of communication was 'i messaging' which was cited across the data as having overtaken the process of 'text messaging'. It is notable that WhatsApp is a social media tool that can be used across all platforms, devices and mobile device packages but at the time of this research 'i messaging' was only compatible with Apple devices such as an iPhone. As the majority of students in this study owned an iPhone, 'i messaging' could be

used. Students from the focus groups indicated that they rarely interacted verbally with peers, friends or family. Convenience was a key reason why such media was rapidly replacing the need to talk. This was seen in this comment,

*Sometimes I will call my partner, but its quicker to send a message, we don't really talk or chat.*  
(FG8)

Where there was a geographical distance between the students and their friends or family they selected the App FaceTime (74%). This was primarily a video-calling application that was only available on supported iOS mobile devices such as the iPhone or some laptop computers. Whilst there is a function for audio calls it is highly likely that this App was used for face to face calls so as to provide an additional more 'human' or immersive connection. One of the students who was living away from home in student accommodation shared how she liked to,

*Face time my parents and family when I am away as I know they prefer face to face communication.* (SSI8)

However, it did appear from some comments that distance was not always relevant as another student revealed that at times the sender and recipient of a message could be in the same space at the same time and, rather than having a face to face, social interaction with each other they sometimes,

*can be in the same room as my family and we will text or message each other.* (FG7)

### **4.3.2 Theme: Organisation, function and recreation**

The students appeared to have become reliant on the use their mobile devices to organise themselves on a daily basis. They were constantly in possession of their devices and so constantly connected to the world around them. The essence of this is shared in the commentary that,

*Everything is being replaced by technology, it's out there, you have to do it to function.* (SSI3)  
*My iPhone and calendar is essential to organizing my day-to-day life. I cannot live without it.*  
(FG2)

The majority of students used the alarm function not only to wake them up in the morning but throughout the day with reminders of what they had to do or where they had to be. For many these small devices had penetrated daily routines so they accessed them before retiring to bed, whilst in bed and before rising out of bed. As one explained,

*I use my device all the time. Once it has woken me up I go on, have a quick swipe, check and send messages. I'll plan my day before getting out of bed, set notes and alarms and reminders for my day so that I don't forget anything. (SSI4)*

And in the following statement another explained,

*the last thing that I do at night before going to bed is check for messages, look at calendar for day ahead, set my alarm, might listen to some music. If I wake in the night I think, I know I'll just go and respond to messages and catch up; this could be at 3am. (SSI3)*

The essence of these activities is captured from one participant when she shares,

*I use my iPhone for everything from social networking, booking holidays, planning a route, ordering food and taking photos. (FG6)*

The students appeared to have a strong relationship with mobile technology across the span of the day and the devices they used allowed them to multi-task and manage their busy lifestyles,

*My time is so precious and I am so busy so it's easier to plan everything for my family and myself with my device, it's like have a personal assistant. So that I remember everything, I use an App for making notes, I would not be able to function without it! (SSI8)*

### **4.3.3 Theme: Communication and connectivity**

The data showed that the use of mobile technology led students to prioritise communication using smartphones and to use, in particular, social networking Apps that were free, efficient and fast. Mobile technology was being used across a range of daily functions and interactions and had become greatly accepted. Noting the need to integrate mobile technologies into daily lives led to an examination of students' reliance on these devices and an awareness that their online lives had become immersive. Students seemed to have become dependent on the technology and a relationship had developed between them and their device. Key codes were elaborated and their identification within the data built a picture of the ways in which the students engaged with mobile technologies. These themes are entwined and self-reinforcing. The following table (Table 22) outlines key themes of: being connected; communication; community; dependency; negative behavior

and habit forming and the frequency of which terms were cited is numbered in one column and the number of participants who made a coded comment are numbered n=1, n=2 and so on, in another column.

**Table 22 The frequency with which key themes were observed in the data**

<b>Key theme</b>	<b>Element</b>	<b>Frequency of codes</b>	<b>Number of participants</b>
Connected	<ul style="list-style-type: none"> <li>• The importance of being constantly connected via the mobile device.</li> <li>• The need for Internet connection.</li> <li>• The need to be constantly connected to individual social, family and friendship groups.</li> <li>• Convenience of being connect with location tracking.</li> <li>• Social media Apps at a swipe of the screen.</li> <li>• Feelings of anxiety and fear of not being contactable.</li> <li>• Never turning mobile device off.</li> </ul>	44	28
Communication	<ul style="list-style-type: none"> <li>• Landscape changed, now communicate through technology rather than face to face</li> <li>• No longer have a need to speak verbally with each other.</li> <li>• Actively avoid making a phone call as it was time consuming.</li> <li>• Quicker to send a message than take time to talk.</li> </ul>	78	34

	<ul style="list-style-type: none"> <li>• Immediacy as sought response in messages as soon as they were received.</li> <li>• Busy message 'traffic time' for postings was in the evening.</li> </ul>		
Community	<ul style="list-style-type: none"> <li>• Individuals had a wide online friendship group.</li> <li>• Updated social media profile highly important.</li> <li>• Conversations were prolific within online communities.</li> <li>• Students had a sense of belonging to an online community.</li> <li>• Enhanced sense of identity with online Community.</li> </ul>	45	28
Dependency	<ul style="list-style-type: none"> <li>• An overwhelming sense that mobile technology had infiltrated daily lives.</li> <li>• Awareness of being reliant upon device.</li> <li>• Increasing dependence on the device.</li> <li>• Sense of being unable to cope without mobile device.</li> <li>• Fear of missing out.</li> </ul>	68	30
Change in behaviour / Habit forming	<ul style="list-style-type: none"> <li>• Awareness of how reliance on the use of mobile technology had become compelling.</li> <li>• Recognition that mobile device had impacted</li> </ul>	38	32

	upon personal behaviours. • Patterns of use with mobile devices had become habits.		
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It may be that students were unaware of how their need to be constantly connected via small, mobile devices had become reliance. They had become so immersed in their use of the technology that it was taken for granted. As one student commented,

*I can't remember anyone I want to connect with that uses anything other than their tech to talk. (SSI7)*

By using social media Apps to set up groups on their mobile devices, students remained constantly connected with peers, friends and family and it was accepted that, *it's the way in which we all connect and stay connected. (SSI2)*. The majority of students explained they were constantly connected to and reliant upon their mobile device with the repeated comment, *I never switch my phone off, Never. (SSI5)* And,

*It's important for me to keep connected. I would obviously be able to live without it but hey, I don't have to, so I use it all the time. (SSI1)*

Students were aware of a need to find a balance in their use of mobile technologies as the potential harm of being constantly connected was recognised. However getting this balance was not easy as one explained,

*mobile technology can become addictive and I know that there is a risk of having a poor life balance due to being 'plugged in' to the device all the time. I have tried to curb how much I use the device but I can't shake the habit. (SSI8)*

Alongside the need to be *constantly connected* with each other was the need to constantly share what they were all doing. Apps were the main mode used to send messages and maintain conversations. Often these connections were asynchronous enabling multiple people to be connected with each other over time. However, in practice such was the speed of response that this gave a sense of synchronicity within their group and there was a growing expectation that everyone would respond if not straightaway as soon as they could. Immediacy of response was habit forming as seen by the commentary,

*If I do not respond within an hour of a message being sent people know who know me, know that I am on it constantly and would start thinking there was something wrong. I suppose having heard myself say that I really am on it too much, rely on it too much and respond immediately. (SSI4)*

The use of mobile devices had become so integrated into everyday lives that there was a widespread expectancy that not only could the device give them immediate access to information but to others. However, in reality they were aware that although they felt constantly connected, they were busy with life events and getting on with their day so new behavior was quickly established. Students clarified they would ‘post’ a message during busy ‘message traffic times’, so that their message would be widely circulated for what is known as ‘hits’,

*we post things at a prime time of day such as 10pm as we know that is when most people are looking at their devices and they will get more hits and likes at that time of day rather than at 2 O'clock in the afternoon. (SSI1)*

The majority of students stated that they would feel uncomfortable without their mobile device and would feel anxious if the device was running low on battery power, as they would not be able to be connected. In this context being connected reduced the fear of missing something important,

*I have to be connected, just in case I miss something or someone needs to get hold of me. (FG5)*

Throughout the data, there was a paradox that being able to communicate in one sphere was closing down another modality of communication. Rather than use the mobile device to make phone calls and talk with another person, the students frequently checked their WhatsApp messages either at home, on the go, during lectures or whilst on clinical placement. Perceptions of communication had changed as one student felt that she ‘spoke’ with a member of her family every day but this was in social media,

*I speak with my brother everyday on Facebook, we talk all the time in our messages. (FG1)*

Talking and engaging in a verbal conversation had consequences for the students’ time management and there was a preference for the convenience of messaging,

*I am so busy so it's easier to send a message as I don't have the time to talk. (SSI3)*

#### 4.3.4 Theme: Immersion in technology, challenges and behavior

Mobile technology was seen to have several benefits: portability, communication; convenience; personalisation and learning (see Table 23).

**Table 23 Perceived benefits of mobile technology for learning**

<b>Portability</b>	<b>Communication</b>	<b>Convenience</b>	<b>Personalisation</b>	<b>Learning</b>
Increased mobility	Connectivity	Ease of use	Personal Apps	Learning on the Go
Anytime	Increased interaction	Quick access to everything	Social media profile	Learn at own pace
Anywhere	Social media Platforms	Speed of use	Apps for organising	Individual style
Flexibility	Apps	Immediacy	Status symbol	Reinforced learning
	Community of learners			Promotes active learning
	Inclusivity			Learn when convenient

The students valued the convenience, flexibility and access mobile technology gave them to information they needed, when they needed it regardless of time of day or night.

One recurring feature noted from the findings was that mobile technology was small and therefore portable, thus enabling the use of the mobile device *at any place and at any time*. All students had an Internet enabled device (s), which meant they could be used *on the go* rather than the users being constrained by desk-based technology. They could be anywhere and continue with their own activities with the knowledge that their device was with them, either in a pocket or a bag. When asked about where the students found themselves using their mobile device the main location that my students highlighted was ‘everywhere’ or ‘anywhere I can get connected’. The most common locations are presented in Table 24 and are accompanied by statements from a selection of students.

**Table 24 Location when using mobile technology and frequency with which it was mentioned by students**

Location	Frequency	Commentary from student
At home	34 citations	“at home, at night when I get a chance to sit down and look at my social media and messages” (S24)
Clinical placement	34 citations	“on clinical placement I can search professional websites, look up terminology and get an answer to my question immediately” (FG5)
Waiting for friends	30 citations	“If I am meeting friends and I get to the pub first and order a drink, I don’t mind as I just sit and go online, do my messages, browse online, look for their location before they arrive” (SSI5)
University campus	30 citations	“I use it regularly on campus for timetables, searching for information. When a lecturer asks a question, I go online to it up before I give the answer” (S10)
Public Transport/ Car	28 citations	“when waiting in the car for my children to finish their activities” (S24). “always when I am waiting for public transport or travelling as a passenger in a car or on a train” (FG2).
In bed	28 citations	“at home, whilst eating, in bed before sleep, if awake in the night and on waking before I get out of bed even” (S12)
Out with friends	27 citations	“its always at hand so that I can search anything, look up things with my friends” (S19)
Shops	20 citations	“out shopping so that I can price match with supermarkets or clothing shops” (SS1)

The data showed that students were mobile and roaming with their technology. They found that the flexibility of mobile devices meant they could use them in any place when

convenient. These students saw themselves as busy individuals in that they were not only managing their everyday lives but incorporating learning at University and attendance at a clinical placement. They viewed the features of mobile technology: portability, flexibility and 'on the go' as intrinsic to their lives.

Certainly in addition to personal life, the BSc (Hons) Midwifery programme of study was absorbing of time. It is a three-year full-time course, and after the first eight weeks of the programme the students have their time divided between university and clinical placement. Currently the course has a proportionate divide of 49% of the time attending university and 51% of the time working in the clinical area. The programme is integrated so that in any working week the students will be working a minimum of two days a week in the clinical area, attending university for two days and have one private study day. As the programme advances in stage and year the clinical hours increase and university contact time decreases until finally towards the end of the three-year programme they work full time, in preparation for being 'fit for practice' at the point of professional registration. When working in clinical practice the students are expected to work with a midwife as a mentor and follow the working shift patterns, which could be a day shift or a night shift and also fall at a weekend. Planning and organization skills are key to managing time and balancing commitments. One of the students used a time management App to organise herself, her partner and other students in her close friendship group,

*I use a management tool on my mobile device called my duty, once I set it up I shared the link with my partner and student's in my group that I work with. I've taken responsibility of doing this so that I can organise when and where we will meet each other and catch up. It's like a calendar you input your off duty, annual leave and anything else and it also imports everything from your own calendar. Then you can view it on a grid, print it out if you need to and just be organised. (SSI3)*

From their perspective, students were busy multi-tasking, balancing their personal, social and academic lives. The majority of students indicated that they would take the opportunity to engage more in mLearning if they could overcome the obstacles and challenges faced when using mobile technology. Challenges related to using mobile devices were coded as physical attributes, technical attributes and network access and

negative behavioural consequences. The following table outlines each category and related challenges represented by coding assigned.

**Table 25 Challenges with mobile devices (frequency with which codes were attributed)**

<b>Category</b>	<b>Code</b>	<b>Frequency of codes</b>	<b>Number of participants</b>
Physical Attributes	Small screen size	34	34 (all)
	Short battery life	32	34 (all)
	Limited storage capacity and access	32	34 (all)
Technical Attributes	Compatibility	34	34 (all)
	Frequent operation system updates	28	34 (all)
	Frequent glitches on Apps	27	34 (all)
	Incompatibility with some websites	16	34 (all)
Network Access	Intermittent Internet	34	34 (all)
	Connection and reliability	32	34 (all)
	Low bandwidth and speed	31	34 (all)
	Increased time to load Apps	27	34 (all)
	Increased time to stream video	25	34 (all)

Negative behavioural consequences	Dependency on device	68	30
	Feelings of anxiety, stress and frustration caused by not being connected and connected	44	28
	Distraction	38	34 (all)
	Browsing off topic	38	34 (all)
	Habit forming and addictive	38	32 (all)
	Fear of missing out	27	27

The small screen size and impractical size of the device for entering large amounts of text constrained their use of mobile technologies for this purpose. However, this was not the case for all students, as despite the constraints of the small screen size and time taken to download material onto a mobile device respondent S11 highlighted what she appreciated most about having a small mobile device for learning was,

*Although the screen is small and that is a nuisance the small size of the device makes it easy and quick to use, I can decide what to read and swipe quickly between pages and return to pages that I saved earlier. (SSI2)*

All of the students acknowledged that the small screen size on the mobile device was unsuitable when reading large amounts of text especially when studying. Students owning both a mobile phone and a mobile tablet indicated that their choice of device was related to the material they wanted to view, for example, when they wanted to view material such as a video or read key reference documents the mobile tablet was their preferred choice due to the larger screen. This helps explain the finding that of the 69% students owning an iPhone these users also had an iPad (58%). Whilst the majority of the students indicated that they used their mobile technology for searching information related to their studies and had quick access to websites that helped them, 84% shared

that they rarely or never had a reason to use their mobile devices to complete coursework or participate in lectures.

In contrast, the larger screen of a laptop computer enabled the students to view a complete document and manipulate it more easily with the Windows environment and enter large amounts of text, more quickly with the standard keyboard. Other physical attributes cited shortcomings in relation to battery life and frequency in charging the device. It is inevitable that small mobile technologies are unable to have the extensive battery life and storage capacity of a computer. Students reported the need to keep charging their mobile devices and experienced problems with their use being disrupted by frequent system operation updates. However, some students explained that they charged their device every day and never let the battery power go below a certain percentage as they did not want to be without their device or have loss of power unexpectedly. Other reported challenges for using mobile devices were related to its technical attributes as one student reported,

*Not only do I have limited battery life, it is frustrating to have frequent glitches with Apps, buffering problems, oh and the incompatibility at times with some websites. (S20)*

In theory these glitches should be overcome with advances in technology but until they are resolved they are seen as challenges that led to frustration.

Concerns related to intermittent and unreliable Internet connection distributed access to social networking sites, stored documents and other Internet dependent function within the mobile device were also expressed and contributed to the sense of challenge in using mobile technology for learning. Students expressed feelings of anxiety about the impact of breaks in connection on not being able to remain connected to their friends or family.

Aside from these hardware and software challenges, several challenges were related to negative behavioural changes, primarily with students expressing their growing need to be constantly connected,

*It's really important for me to be connected at all times in all places and if I have disrupted use it causes me anxiety and stress. (SSI3)*

Prevalence of these feelings was increased when the students were undertaking clinical placement hours, when it was difficult to remain connected to Wi-Fi services when working in a hospital. This was mainly due to ‘fire walls’ that were in place to protect specialized hospital equipment. Further to this, it was seen unprofessional to use mobile devices at the point of delivering care. However, this is changing within the clinical workplace and will be discussed further in the subsequent chapter.

Information overload was cited as another challenge as there is often so much to read and so many resources to move between once students started investigating a subject. More often than not, once you start browsing a topic then other perceived links appear and in no time the user has moved away from the task in hand having been distracted by something that they have found more interesting as one student states,

*M Learning is a major distraction, as browsing leads to different links, taking me off topic.*

(SSI4)

This behavior and movement between pages and websites has to be balanced as the learner develops their own personal style with the usage of the mobile device and learns how to take control. Reports of becoming distracted when using mobile devices by other Apps or pop-up alerts and incoming messages (S13, S17, S20) did not deter the students’ use of their mobile devices.

Furthermore, students reported feeling uncomfortable using their mobile device for coursework as they were concerned that they would not be able to work on different files simultaneously, store and retrieve their documents efficiently or upload coursework to online submission areas via a mobile device.

The findings indicate that regardless of the perceived challenges associated with mobile technology they have a positive outlook on the use of mobile devices to enhance their learning. There is sufficient evidence from all data collected across the different methods that students found the use of mobile devices to be easy to use, portable, and unobtrusive. However, there were some difficulties and constraints, which limited their usefulness.

The findings showed that the use of mobile devices was habit forming. Most of the students (94%) used their mobile device for up to two hours a day and over half of them (58%) stated that this time would increase up to approximately four hours, if and when they were using their mobile device for entertainment purposes such as watching a film or videos, listening to music or playing games. In most instances checking the device was an automatic response, for example to access social networking Apps for messages and content. During the semi-structured interviews and focus groups students were surprised that once having reflected on their online activity that they used devices for far longer than they had imagined or intended. Most of the students felt that they had developed the habit of checking in excess of 20 times a day, before going to sleep, between sleep and on waking from sleep.

A repetitive term used by students was ‘habit’ and ‘addiction’, indicating that the constant use of mobile technology and behavior of checking social media for messages had become rather than unthinking. The need to know what everyone was doing, and update social media profiles and being constantly ‘plugged in’ fueled a sense of ‘addiction’. Some comments reflected this,

*it's like conditioning, as soon as I hear the ping I go straight to my device to see what I have missed. I need to know what everyone else is doing and feel that I have to respond instantly to let them know that I've seen the message and make a comment. (FG5)*

and

*I always have my device with me, in my pocket or in my bag...even when I am in the shower and cooking dinner. I am addicted to using my device, I always have it with me, sometimes I pick it up and don't even realize that I have and swipe for messages, catch up on social media even though it could have been half an hour ago. (SSI8)*

Not only was the nature of the relationship a person had with their mobile device important but also was the influence that the device had on personal relationships. One student shared that using mobile technology had changed the way that she communicated with everyone and that the only person that she continued to send text messages to was her mother and that was because she was not on a social networking site (SSI14). Following the interview this student became upset as she realised that she had not spoken to her mother or met with her face to face for several months. Up until

the interview she had been content with the way in which she ‘thought’ she had been ‘keeping in touch’ with her but recognized that although she had adapted to the use of social networking she had expected others to do the same. Once comforted she pledged to phone her mother, have a conversation and arrange to meet face to face and have a social interaction.

#### **4.3.5 Theme: Engaging the learner and learning on the go**

At this juncture it is appropriate to start considering what the findings inform us about how the students perceived their use of mobile technology for learning. Phrases such as ‘learning on the go’ were used by the students to describe mLearning. They spoke about the value of having access to information all the time, anywhere and most importantly access when they needed to know something. Several students explained that their mobile technology was a ‘portable, pocket sized tool’ and referenced it as ‘pocket learning’ rather than mLearning,

*I can use the device on the go, pick it up and put it down to fit studying around my life and day, it’s the convenience of having it in my pocket. (FG8)*

Another student said,

*It’s always in my pocket, easy to use everywhere, keeps me on the go and I can use it for reading articles or look up things for study. For me its pocket learning...mobile technology lets me learn in different ways and gives me information at my fingertips rather than having to be consumed with trawling through books. (SSI 6)*

The students saw opportunities for learning with mobile technology outside of the classroom especially when working in the clinical placement areas. They used specific Apps that informed and reinforced clinical knowledge instantly, for example;

*I rely on the British National Formulary (BNF) app on my hand held devices and I use this all the time when I am on placement. When I come across a drug that I do not know then I will go to the BNF app and have a look. I was even on placement one day and an anaesthetist was querying a drug and its dosage so I suggested looking the drug up via the BNF app and we got an instant access to the information that we needed. (SSI2)*

And another one said,

*I have a drug calculation app, which I use on clinical practice so that I can look up the answer immediately. (SSI4)*

Across several locations and within their physical, conceptual and social spaces the students appeared adjusted to a flexible method of learning that was no longer restricted to a classroom but dispersed in time and place. They sought flexible ways of learning and were using their skill and dexterity in managing their mobile device to allow them to learn when the opportunity arose.

When learning on the go students not only referenced to access information but to their ability to connect with other people, share information and join discussions to aid their learning. Some students claimed that they found the micro blogs and function of social networking online with professional midwives, through Twitter, offered them an extension to their learning. This platform gave them easy, immediate access to a wide range of professional information and learning resources. Essentially, the students using Twitter considered themselves to be part of a wider professional midwifery community. Proficient mobile device users joined the 'tweeting community' connecting them to local, national and global midwifery communities. Connecting in 'real time' to agencies such as: the NMC; Department of Health; Royal College of Midwives; and professional midwifery groups enhanced students sense of professional identity. This connectivity and association with the midwifery profession appeared to strengthen their desire to read, become informed on contemporary issues and clinical guidance, driving their aspirations to become an effective midwifery professional;

*I use Twitter regularly and follow eminent people in midwifery to keep updated on what is current. It is an effective way of getting press releases, guidance updates and finding out about different conferences that I can attend as a student midwife. (SSI7)*

Students claimed to receive a lot of help and support from each other by using social networking sites. At the start of their midwifery programme they set up a WhatsApp group and Twitter account to remain connected with each other and share key resources and websites. One student valued growth in knowledge by being connected to a community of learners,

*I follow Twitter conversations that might increase my learning, I re-tweet them to my student group and share interesting websites with them. (SSI1)*

Beyond this, the students joined other specialist interest forums; professional groups and sought to join webinars that were advertised through social networking sites. A

sense of belonging to a professional group and affective support from peers appeared to reduce anxieties that were present in the data about being on a *'lonely journey with a lot to learn'*, and being *'isolated'* as it served to break down feelings of isolation. On an organisational level students managed their mobile devices to plan their university work, set calendar alerts for lecture times, coursework submission dates, access online timetabling and ensuring that, *both personal and university email accounts are linked to the mobile device (S4)* so that nothing essential was missed or forgotten.

It seems that whilst students were adept at using mobile technology when it came to use the device for learning, they were sometimes learning as they went along in an 'ad hoc' fashion,

*I use my mobile device all the time but I have had to teach myself how to use the device.*

*I access the e-catalogue from the library, key documents, clinical guidance, resources that I need, when I need them because I need to get access to things I need quickly, when I want them. (S10)*

The data also revealed how the use of technology had led many students to see that the way they learnt had changed. Table 26 presents survey responses indicating perceptions on how mobile technologies had been transformative in the way that they learnt.

**Table 26 Key features of how mLearning had changed the way individuals learn (frequency with which codes were applied)**

Statement	Number of respondents reporting no change	Number of respondents reporting a change (total n=34)
Mobile learning affords flexibility in time and place of learning	1	33
Mobile learning has encouraged my ability to be an independent learner	3	31
Mobile learning and the mobile learning device has	4	30

sustained my interest in learning		
Mobile learning has accommodated my individual diversity and learning style	4	30
Mobile learning has encouraged me to reflect on the learning material	9	25

When asked if mobile technologies had changed the way that they learnt 92% of the students claimed that it had influenced their learning. Overall mLearning has led learners to be more efficient in the way and ‘speed’, at which they learnt, this was cited by 32 students and captured in text,

*It has changed the way I learn, the speed of access means that the pace of learning has increased.* (S21)

All students reported that they did use their mobile technology to access the electronic library catalogue as it saved them time. They could access relevant material without having to travel to the library and that it was, “*easier to look things up or use Apps on the device than having to find a book*” (SSI3). There was a strong opinion that learning was some how ‘quicker’ with mobile technology and less constrained. This was seen in a comment,

*I look at global information and networks that I wouldn't have done before, and that would not be possible to recreate in the context of a classroom.* (SSI6)

A repeated comment from students indicated that they made space for using their mobile technology to aid learning, join online conversations, follow discussions and set up ‘push notifications’ from websites and organisations to save them time searching for the latest information themselves. This reinforces the importance they bestowed on the convenience of using the device for short bursts of time to access information when they needed it. It can be argued that these findings show limitations, students were accessing discrete information rather than organising their learning through broader meaningful concepts. However students appreciated that there needed to be a balance between the amount of learning with mobile devices and taught, face-to-face teaching sessions, as one put it,

*I think that the balance needs to be right when learning through devices, maybe the topic under study needs to be introduced and then followed up in the classroom with a face to face*

*discussion. That way you can check that you have understood and comprehended what you were supposed to learn. (SSI4)*

The essence was that mobile learning should not replace the need for traditional classroom teaching but complement and build upon such.

Some commentary from students suggested that, not only had mobile technology influenced a change in the way they learnt by accessing, “*short bursts of information; linking to professional social media sites; returning to information when I need to revise*”, but it gave rise to the notion that their learning had ‘increased’. However, interpreting ‘speed’ of learning is difficult and at times the manner in which students talked about speed of learning indicated that they were seeing learning in a rather superficial way. In contrast several of the students identified how they used mobile devices for deeper learning, citing the way that they were able to relate a theoretical module related to complexities in childbirth. Several indicated they were able to make links from what they had seen in previous theoretical modules too as one commented,

*I found that while using the mobile device I was able to apply the knowledge and skills that I had gained in the last clinical placement to the current module of learning. (FG4)*

The findings also indicated that nearly three quarters of students felt that mLearning had encouraged them to reflect more on learning material and how it helped them to consider how the material could be applied. This in addition to an opportunity to access information whenever and wherever they needed. Nearly all of the students agreed that mLearning afforded them flexibility in time and place of learning and that they would take the opportunity to learn other skills supported by a mobile device and Apps for learning. Overall the data indicated that there were several opportunities for students to use mLearning to gain confidence, competence and indeed competence. The ubiquitous use of mobile technology and devices has now encroached upon the clinical areas, and I can further report that when I was working in my role as an academic visiting the clinical practice areas during this project it was becoming commonplace to view a row of mobile phones on a window shelf or designated area so that the devices can remain connected. One student said,

*My phone is always charged and readily available so when I want to know something I can look it up there and then and discuss it with my mentor. (SSI1)*

## 4.4 Chapter Summary

Chapter 4 has reported the findings of the data from the: OSCE; survey; focus groups and face-to-face semi-structured interviews. The themes that emerged from the triangulation of the findings were presented as: *communication; organization; recreation; connectivity; access and ease of use; learning on the go; immersion in technology; challenges and behavior and engaging the learner*. The findings showed not only that all students owned a smartphone but that these devices seemed to offer unrivalled opportunities for: social communication; online interactions; professional networking; digital resources and linking teaching and learning in theoretical and clinical contexts any place and at any time. The students demonstrated awareness of the opportunities of using mobile technologies for learning. Emphasis was put on the portability of the mobile device and the flexibility that this gave to learning on the go. Devices were seen as essential tools, used every day by students to aid social communication; organisation of self and recreation. Students were aware of the challenges posed by a dependency on mobile devices. They also highlighted several fundamental challenges when using mobile devices for learning. The physical attributes of the small screen on a mobile device was a challenge, as was the short battery life and low capacity for storage. As regards network compatibility, students complained about connectivity problems with intermittent access, frequent glitches and operation system updates.

Several consequences of using mobile devices and technology emerged, and some students reported feelings of anxiety, stress and frustration when not being able to obtain an Internet connection. Similarly, some students experienced negative emotions in respect to being continually connected to their mobile devices and found that they were unable to remove the temptation of checking social media platforms. Fundamentally, the students in this study were immersed in technology and their online world. Whilst social networking sites had the potential to facilitate effective networking, access to professional groups offered a sense of community and belonging, a growing reliance on the use of mobile technology was evident. The findings from the data provides a richer and deeper understanding of how learners make use of mobile technology and with what consequences.

## Summary points

- Ownership of an Internet enabled mobile device was seen as essential for social networking, managing daily lives and being connected to the world around them.
- Portable, flexible, easy to use and convenient were terms used to reinforce the essence of *learning on the go* with mobile devices and *learning anyplace at any time*.
- Several challenges and barriers in the use of mobile devices arose with access to reliable Internet services being essential for sustained access.
- Immersion in technology was not without consequence as some students recognized a change in behavior and formation of particular habits associated with an over reliance on the use of small hand held device. The speed in which information can be accessed and immediacy to information and other people emerged as the students became immersed in the use of technology.
- Mobile technologies and devices result in an increased sense of connectivity with others, and generated a sense of inclusivity within a community of people and learners.
- Mobile learning engages the student to use contemporary technologies as tools to develop creativity in the way that they learn.

## 5.0 CHAPTER 5 – DISCUSSION

### 5.0 Introduction

This chapter follows on from the presentation of the data in the previous chapter. It discusses the findings in the wider context of the research questions. It is divided into five main sections. Section 5.1 returns to the roots of my curiosity in mLearning and addresses my first sub question, what mobile devices do the learners have and what do they use them for? Section 5.2 addresses the second sub question, what do learners perceive to be the benefits of mobile learning? The challenges of mLearning are integrated into this section. Meanwhile, in section 5.3 the question of whether bespoke learning material has a place in mLearning is addressed. Next, section 5.4 discusses the overarching question of how learners make use of mobile technologies and with what consequences. This is followed by two sections exploring the integration of mobile devices into professional learning. Section 5.5 looks at the key questions surrounding the use of technologies, including some of the well reported concerns over health and safety. Section 5.6 steps reflects on all that has gone before and offers a model for finding a way forward for the integration of devices; this is the Social and Technological Ecosystem of Learning framework. 5.7 offers a summary of the key findings from the discussion.

### 5.1 What mobile devices do the learners have and what do they use them for? (Access and use of technology)

I found that all of the students owned an Internet enabled mobile device in the form of a smart phone or tablet and used them intensively in their everyday lives. The choice of device ranged between iPhone, iPad, iPod, android phone or an android tablet, with the iPhone being the most popular mobile device (see section 4.2.1 Table 17). Here these findings match Williamson and Muckle's (2018) study, which showed that almost every nursing student on their course (99.7%) owned a smartphone. This matches too with other data on mobile device ownership and the importance of having quick, rapid, responsive communication tools (Statista 2019). Communication was ranked highly as a use of the devices as did the use of social media Apps.

Students accessed the Internet using their mobile devices for a range of activities in particular social networking, organising functions and recreation (see Table 18). Several built-in Apps on the devices were used for organization and recreation functions (i.e. shopping, booking restaurants, photography, and setting alarms). The range of activities can be seen in Table 21 within chapter 4. Students were clear about which Apps they used and why they used them. In particular specific Apps such as Facebook, WhatsApp and i-messaging were highlighted as the most popular for the purpose of social networking and use of online social media with colleagues, peers, family and friends (see Table 19). When respondents wanted to interact and network socially for 'fun' with friends and family and have 'live' interaction with each other they chose other Apps such as: Instagram; Snapchat and Twitter. Again data in my study matches other studies (e.g. Williamson and Muckle, 2018) and shows that the demand for mobile devices has grown rapidly (Quillen, 2011) and mobile, digital technologies are visible everywhere and used by every age group and country across the world (Al-Emran, Elsherif and Shaalan, 2016).

Students in my study reported a sense of identity via their online participation and belonged to online communities (see section 4.3.3). When using social media platforms they placed high importance on updating their social profiles and personalising their devices. Mobile technology offered unprecedented opportunities for connecting and interacting with peers, family and friends both synchronously and asynchronously. Mobile use appeared at times seamless and permitted rapid switching between multiple learning tasks and as such has the potential to blur the boundaries between various 'virtual spaces' and 'real world spaces' that we move between.

Before I leave the discussion there is one more comment that I would like to offer and that is around the professional use of social media. As networking across multiple platforms increases, alongside the growing understanding that mobile technologies are here to stay, guidance for responsible and professional use of social networking sites has been provided by the professional regulatory body (NMC, 2019d). This extends and is applied to all types of online communication such as: website; blogs; discussion boards; text messages; photography; images; videos and audio files. It has been reported that the increased presence of mobile technology in the clinical area could lead to conflicts with confidentiality (Beauregard et al 2017) and seen as unprofessional

(Johansson et al 2013, Koh et al 2014 and Beauregard et al 2017). Concerns were raised about the misuse of social media if student nurses were observed using a mobile device in the clinical area. Over the past few years this perception is changing and mobile technology is becoming increasingly abundant in the clinical area. Unprofessional conduct on social media can lead to potential removal from the professional register and for student midwives places their eligibility to register with the regulatory body at risk (NMC, 2013). It is therefore expected that professionals will not post anything on social media that is deemed discriminatory, breaches confidentiality or fails to protect the public or themselves.

## **5.2 What do learners perceive to be the benefits of mobile learning?**

Mobile devices are used primarily for social and personal purposes but are often seen as useful for learning. This is important as we have a deep-rooted idea that learning occurs within an educational establishment and is usually confined to one setting such as a classroom. In fact students in this study fully recognised the importance of classroom learning and the usefulness of 'theoretical knowledge'. However they also perceived benefits for learning via mobile devices and these coalesced around four key opportunities: access to just in time knowledge; linking theory and practice based learning; access to authoritative input and social support.

***Access to just in time knowledge:*** One of the strongest benefits of learning with mobile technologies is the flexibility afforded to the learner in being able to access learning resources at a time that is convenient to them. The findings from this study reinforce ideas such as ubiquity (Kukulska-Hulme et al 2009), immediacy and convenience (Kynälahti, 2003) of being able to learn 'on the go' (Sharples et al, 2009) whilst accessing 'just in time' information (Kukulska-Hulme, 2010) 'at anytime, anyplace, anywhere'. Woodill (2011) conceptualised mLearning in terms of technologies and function, and noted the flexibility afforded to being mobile and learning 'on the go'. My study builds upon this understanding and shows alongside Crompton (2013) that the use of mobile learning is complex, consisting of many different connected features that are interdependent upon each other.

The perception by students that they could obtain information when they needed it by using their mobile devices chimes with the concept of 'just in time' that is often put

forward in respect to flexibility of mLearning (Killi and Morrison, 2015). In my study, students talked about the ease of short-burst, multi-tasking style of activities that met their social and learning needs, once again reinforcing the optimism of early commentators on the affordances of mobile technologies (Attewell, Savill-Smith and Douch, 2009 and Kukulska-Hule, 2010). Students spoke about getting answers to questions by setting up 'push notifications' on their devices; setting alerts on professional websites and organisations to receive up to date guidelines; posting questions on the module VLE for peers; general access to bite-sized material. This led to a perception that this was a faster way of learning.

***Linking theory and practice based learning:*** Here students spoke about how they could access resources to make sense of what they were experiencing in clinical practice. For example they supported knowledge gained from a face to face session simulating the manoeuvres and process for managing a shoulder dystocia at university and used the shoulder dystocia App whilst on clinical placement. They further talked about accessing the module VLE to organise their learning and remain on track. This helped give them an impression that they had not let go of their university learning once they had moved to clinical practice. The use of mobile, hand-held technologies confirms the importance of re-shaping the way that educators teach and learners want to be taught (Wankel and Blessinger, 2003).

***Access to authoritative input.*** A key example of this was the professional verified App for learning (shoulder dystocia). An important feature here was the opportunity to access the App as they could use it anywhere, anytime and as often as they liked. Students perceived they could learn at their own pace; rehearse and recall the information contained in the App; and go on to gain a deeper understanding of how to manage the obstetric emergency of a shoulder dystocia (see section 4.1). Students could also access other Apps and a range of other material from professional bodies. This was facilitated when lecturers provided links to appropriate resources and explained how these resources could help them to achieve competence in particular clinical areas.

***Social support:*** using social networks within and beyond course members allowed students to follow discussion threads primarily through Twitter but also by joining professional online debates in the midwifery arena (see section 4.2.3).

These are important benefits emerging from the use of mobile devices and add up to a strong argument for further developing their use (see Section 4.3.4 Table 23). However, before leaving this sub question we need to know more about the challenges that impact upon the effectiveness of mobile technologies for function and learning. The findings suggest that the functionality of the technology (i.e. battery capacity; unreliable Internet connections), specification of the technology (i.e. small screen size; battery power capacity) and sociability of the technology (i.e. social media platforms; quick responsive messaging; constant access) impacted upon the learning environment of mobile learners. As important were social cultural factors such as distracting and time consuming habits and at times an unhelpful desire to be connected constantly. Within my study the challenges and disadvantages of using mobile devices were categorized into three separate areas; practical, technical and learning.

The first two of these areas were strongly interrelated as they dealt with the ease of use and functionality of the technology. Learners noted that the small screen size on the mobile device was unsuitable when reading large amounts of text especially when studying and the challenge of the small screen size is regularly reported in the literature (Manimar et al, 2008). However, screen size did not deter students from accessing the university's electronic library catalogue to view journals and books online. All of the participants acknowledged that having mobile devices replaced the need to travel in to campus to use the library facilities and they balanced the convenience and flexibility of using mobile technology against the challenge of the small screen and the potential eye-strain that this caused. Embracing digital technology for education with mobile learning was found to be undeniably useful but some worried that it could weaken their skill of literature searching and reading textbooks.

Further, although mobile devices are small powerful tools they were found not to have the same storage capacity of a computer. Technical challenges such as reduced battery life, limited storage capacity and frequent system operation updates. Another frustration for students was unreliable Internet connection and incompatibility of

mobile devices with some websites. Intermittent Internet connection for activities that were Wi-Fi dependent were more challenging when the students were out on clinical placement, this was due to the strong ‘firewalls’ that hospital infrastructures had in place to protect equipment and data. In other locations, students reported the need to constantly charge their mobile devices and experienced problems with buffering and glitches with Apps, thus affecting the seamless connectivity with materials (see section 4.3.4 Table 25). These findings around functionality are not unique to this one study and similar difficulties have been reported elsewhere (for example, Johansson et al, 2013, on connectivity problems see, for example, Koh et al, 2014) and on limited memory capacities of mobile devices, (Elias, 2011).

### **5.3. Does bespoke learning material have a place in mLearning?**

The conclusion is reached, already hinted at in the above sections, that bespoke learning material can be integrated into midwifery education and on other courses, especially those professional courses where there is a combination of theory based teaching and practice based teaching and learning. Indeed it can be argued that, as the use technology in the fields of medicine and nursing has expanded, the development of mobile medical Apps have become one of the most common sources of knowledge for nurses. In order to prepare the next generation of healthcare professionals, education providers need to accept the integration of mobile nursing and midwifery apps for learning. A survey by Wolters Kluwer Health (2014) identified that 65% of nurses use mobile devices in their professional work. This is supported in my study which indicated that all students owned a mobile device and were using them to access Apps for learning. It also revealed that students had a desire to have access to more Apps to enhance their learning whilst on the go and in the clinical area. This is in line with research findings by O’Connor and Andrews (2018) which revealed that nursing students had well developed perspectives on how they would integrate the use of mobile Apps to support their learning and recommended more research to examine if mobile technology can improve learning outcomes for activities outside of the classroom.

From this study the key conclusions are that the use of Apps can bring about learning gains, albeit these gains are challenging to conclusively evidence and may not be seen

in all domains of professional knowledge (see section 4.1 and section 4.3.4). One key contribution that bespoke Apps can make is that they can be used in both the classroom and sites of practice. However, such Apps are not cheap to develop and the need to pass strict standards in respect to following best clinical practice and reflecting state of the art medical knowledge make them time consuming to design.

#### **5.4 How do learners make use of mobile technologies and with what consequences?**

The omnipresence of mobile technologies places mobile devices at the centre of social, educational and business worlds and we are increasingly seen as living in hybrid worlds in which the ‘virtual’ is enmeshed in the physical (see for example Šimůnková, 2019, writing about consumer behaviour). In terms of mLearning this entanglement of virtual and physical is interesting as students often do not realise the potential mobile technology has for learning as they focus more on social attributes. It is as if they need to be guided as to how to unlock this potential and build upon the informal learning through professional and social networks with which they participate and engage. As regards learning, I found that when the opportunity arose students actively sought flexible and dynamic ways of learning with mobile devices outside of the classroom setting. Free from the constraints of face-to-face meeting and desk-based technology they were no longer restricted to a classroom but connected across several locations. They had their own physical, conceptual and social spaces. This resonates with the interpretation and understanding offered by theories of social constructivism that underpin collaborative learning, resulting in mLearning for people who are mobile with their devices (Hardless et al, 2000).

It is important then to consider how mobile devices work and consider potential limits on learning with mobile devices. First, is the key idea of mobility itself. Mobile devices transcend the boundaries of this structure, as students do not have to be restricted to one location in order for learning to be effective. Students considered the advantages of mobile learning as having access to learning materials, *anytime* and *anywhere*. Students explained how they might access materials late at night, during break times whilst on clinical placement or anytime that they needed to search something or research a topic. In relation to being *anywhere*, students talked about accessing learning while travelling on a bus or a train; between locations such as university; home; clinical placement (see

Section 4.3.4 Table 24). This confirms what commentators recognise and associate with characteristics of mLearning (Keagen 2005, Traxler 2005, Parsons and Ryu 2006, Sharples et al 2009). Phrases such as ‘learning on the go’ were used by the students to describe their use of mobile devices. Several students explained that their mobile technology was a ‘portable, pocket sized tool’ and referenced it as ‘pocket learning’ rather than mLearning (see Section 4.3.5). Again, these terms have been established in the literature around mLearning and Quinn (2000) reported on mobile, wireless and ‘In-Your-Pocket’ learning. Mobile learning is seen as being, quick, easy and convenient. From students’ perspective they were learning whilst being busy multi-tasking, balancing their personal, social and academic lives. However, there is a paradox here between the students concept of mobile devices saving time when the use of them takes up so much of their time.

Second, the practices which have grown up around the use of mobile devices. The majority of students had grown up around technology and used it in their everyday life; indeed these devices had become integral to students’ everyday lives. This led to a growing expectation from students for a flexible approach to their learning and a willingness to engage in it, often going in directions that the university tutors themselves might not have known about.

Third, a sense of personalization and control. It can be argued that the emphasis on portability and convenience, flexibility and easy access to information offers the learner **control** over their learning and empowers them to be active participants in their learning. Commentators on mLearning recognize how the features of ‘*learning with mobile technologies*’ (Anderson and Blackwood 2004, Song and Fox, 2008), combined with ‘*learners on the move*’ (Wong et al 2010) provide the student with a ‘*dynamic, seamless and ubiquitous learning experience*’ (Wong and Looi 2011, Ting 2013, Song 2014 and Kearney 2015).

As regards limitations on learning, this is an area that has had less discussion in research literature, as most reports on the characteristics of the device or network connection. In my study the first constraint on learning was the only limited awareness students had of how to get the most out of mobile technology. For example, not all students knew of the full range of Apps that could benefit their learning and at times they were

uncertain as to how to access course materials. They were restricted in how they could use their mobile devices in clinical placement and mentors and support staff were at times discouraging mobile devices use. The sites for support were not always shared. Lecturers at times showed a similar lack of awareness and did not always discuss how resources could support their learning. Much of the learning that students talked about appeared at a surface level ('short burst of learning' or 'faster learning'). Bloom's learning objectives classify learning according to the increasing level of difficulty and provides a systematic process of describing how students develop moving through three overlapping learning domains: cognitive, affective and psychomotor. In student accounts mLearning seems to plateau at the level of recall and comprehension (Adams, 2015).

There are not only technical difficulties associated with mobile technology but also some health concerns that should not be ignored. By default mobile learning increases the amount of time that users spend looking at a device and small screen. In my study these health problems were not reported but this is not a reason for complacency. Recent studies have considered the harmful impact of screen time on mental health and physical wellbeing. Whilst the majority of studies in this area focus on children and young adults (RCPCH, 2019) the key messages are relevant to all screen users. It has been noted that excessive screen time can lead to potential health related problems such as eyestrain and headaches (Sheppard and Wolffsohn, 2018). Screen time can also be habit-forming and in some cases addictive (Vance, 2018). Recommendations have been made to actively try to reduce the amount of time spent in front of a computer, mobile device or TV screen (RCPCH, 2019). To counter balance the consequences of increased screen time on health, various commentators point to the benefits of using mobile technology in the spheres of mental cognition, visual intelligence, improved hand to eye coordination and increased academic knowledge (Yang et al, 2019). Some arguments are made that research should focus more on what individuals are doing online and less on how long they are online. As learners personalise their learning with mobile technologies they should be encouraged to consider and indeed monitor the time they actually spend using the device. Indeed updated mobile devices now have inbuilt Apps to show the user the amount of screen time they have engaged in on a daily basis. Students in my study were acutely aware of the need to balance their use of mobile devices as being constantly connected might upset their life balance. They also

talked about the addictiveness of being connected to friendship groups, family and peers (see section 4.3.4 Table 25).

There is no need for the reported panic around mobile phone use that often appears in the press but there is quite a lot of evidence that extended use of mobile devices can lead to anxiety and a lack of focus and disturbance in mood (for example Zulueta et al, 2018) and for a conceptual overview and systematic review on the relationship with anxiety and depression psychopathology in excessive smartphone use see Coyne et al (2019). In this study mobile technology was not a cause of depression and no one reported depressive symptoms but some unhappiness about phone use was reported and some distress observed. Commentaries from students suggested that the use of mobile devices was habit forming, and a feeling that being constantly 'plugged in' and trying to 'shake the habit' could lead to unhappiness.

## **5.5 Integrating mobile devices into professional learning**

This research has shown how learners have engaged with mobile learning but how should such learning be integrated into undergraduate professional midwifery education? Part of the answer is that, with better understanding of student mobility and better communication between students, there is an opportunity for lecturers and clinical support practitioners to address the learning theory gap that exists in professional education (Rolfe, 1993). Indeed, technology enhanced learning has been widely seen as capable of bridging the theory / practice divide for student nurses and midwives as it can support the integration of theoretical input into clinical practice. However, such integration both in this programme and more generally has been limited largely to the use of Virtual Learning Platforms (VLE), which help students organise and manage their participation. The key issue discussed in the literature is the inconsistency between what the student learns in the classroom with what they learn in practice (e.g. Brasell and Vallance, 2002). To help bridge this gap the Dreyfus model (1986) of clinical skill acquisition is widely used in nurse and midwifery education. It is a means of assessing and supporting progress in the development of skills or competencies. It is a model adapted from earlier versions of 'concept' introduced by Benner (1984) to explain the development of nursing skills at different stages of their experience over time moving from novice to expert. Despite contention and criticism

that competency is difficult to manage, the model remains a stable feature in the design of nurse and midwifery curriculum.

The Dreyfus model (1986) extended the distinct stages proposed by Benner (1984), widening it to six stages instead of five. These stages imply that the process of practical skill acquisition is achieved through successive transformation of skill, moving between the stages of novice; advanced beginner; competent; proficient; expert and master. Educators recognise that the level of expert or master does not signify that the individual learner or practitioner requires no further development but that they need to continually evaluate their practice and skills in line with new evidence. At different stages of a professional's working career, when challenged with new activities the model can be used to assist professionals develop and achieving their goals. The fact remains that nursing and midwifery students continue to face a variety of challenges to learning in clinical practice (O'Connor and Andrews, 2018) and mLearning and the use of emerging technologies is one way to address these challenges. In fact the evidence offered in chapter 4, section 4.3, illustrated that students are social in their learning and have proliferate use of social and professional networks for communicating and keeping up to date. They also had the opportunity to connect university experiences with clinical ones, as seen for example in the use of Apps.

In bridging the gap there is an opportunity to provide greater tailored input. I found this in general terms but also in specific terms in particular the use of specialised Apps for skills drills. Interestingly, in relation to the case of teaching the shoulder dystocia, learning was focused and contained, rather than ad hoc and just in time. The App was closely tied to the curriculum as taught and a clear attempt was made to channel mLearning into a particular direction. This seemed to work both in terms of reported test outcome but also in respect to student comments. The students engaged with the App for two reasons: firstly because they could see and understand the importance of needing to gain knowledge about how to manage the obstetric emergency. Secondly, they desired to demonstrate their knowledge and what they had learnt during the OSCE and experienced a sense of achievement in terms of professional skills. One conclusion here is that there should be more mLearning which is focused and targeted as it encourages students to be engaged at a higher level rather than superficially accessing information and networking sites.

Providing curriculum input is key standards framework for nursing and midwifery education (NMC 2019a), alongside the standards for student supervision and assessment (NMC 2019b), assist midwifery students in achieving the NMC proficiencies and outcomes expected of the programme and profession. These standards are both driven by theory and clinical competence leading to the transformation of the individual to make intelligent, ethically responsive judgments in clinical practice. A learning culture is fostered and approval of programmes is only validated when there is evidence that the learning culture reflects: ethical; open and honest; safe effective learning, leading to the fulfillment of competence and professionalism. The midwifery curriculum is a dynamic process, which reflects the changing realities of professional practice in an ever-changing complex multicultural network. It is very much driven by the building blocks of competency-based education (Fullerton et al, 2013). Inherent with the requirements of the professional legislators (NMC), essential global competencies for basic midwifery practice are included from the International Confederation of Midwives (ICM), which add to its professionalism.

There are activities and practices, which grow up around classroom teaching, which are undoubtedly useful and important. For example, focused classroom simulation is known to enhance clinical practice especially where clinical practice is infrequent as is such in the management of obstetric emergencies such as a shoulder dystocia (Cooper et al, 2012). The NMC (2009, 2019c) support the use of simulation as a teaching method to aid the development of midwifery students. It is seen as an opportunity to expose students to an artificial representation of a real world experience ready for practice. Effective simulation facilitates safer practice through experiential learning that results in enhanced knowledge, behavior and skills. It provides opportunity to repeatedly rehearse, receive constructive feedback, evaluate and reflect upon performance. There has been a long history of using simulation in the training of health care practitioners and simulation based learning offers a great deal to midwifery education. Simulation and face-to-face interaction permits the learner to correct skills if performed incorrectly, rehearse the skill in a safe environment returning to notes and the application to view the video material. More recently it is recognized that training individuals rather than teams can lead to critical steps being omitted from the sequence during management (Siassakos, 2011).

During clinical placement student midwives are encouraged to attend the multi-professional skills drills where they learn with and from other health professionals that will be involved in this obstetric emergency. In contrast mobile learning on its own may lead to isolation and individualised learning. Thus it is important that mobile learning should create links rather than break links. Students should be able to access institutional learning support when on placement but they should also be able to access Apps to support learning – in fact the number of Apps has become huge and there is an abundance of medical and health care related support (Woodill and Udell 2011). One conclusion here is that course leaders need to help students become aware of the opportunities Apps provide and show them how to be discriminating in what they select. The midwifery profession is facing and preparing for a ‘new era’, where technology-enhanced and simulated learning opportunities will be essential to curriculum content and education but the fundamental structure of midwifery accreditation will remain intact.

Professionals provide holistic health care to the service user so it essential that learning for professionals should be holistic. By this I mean that, in relation to mLearning, students are part of something that is intimately interconnected and understood only in its entirety. In the context of mLearning and professional learning, it is necessary to review the underpinning value of professional knowledge and professionalism. All midwifery professionals, including students in training must practice in accordance with the requirements of the Code (NMC 2018), the professional standards of practice embracing the values and behaviours that promote professionalism. The terminology around professionalism is important as it distinguishes one occupation from another on the grounds of the completion of formal qualifications, clinical skill and specialized knowledge. Embedded within nursing and midwifery education is the understanding of how areas of theory are connected to practice and the influence this has on developing a practitioner who is accountable, knowledgeable, clinically competent and professional. Eraut (1994) identified knowledge in practice as; process knowledge involving skilled behavior and personal knowledge influenced by impressions and experiential interpretations. Usher et al (1997) argued that there is knowledge in practice rather than simply knowledge for practice. When professional practice is viewed through propositional knowledge of theories and concepts, sound professional

knowledge is created. Assessment of theoretical knowledge, clinical skills and competence is needed to provide high quality midwifery care.

Mobile learning, I argue, should be better integrated into professional learning as it can assist in development of both theoretical knowledge and clinical skills, which are core in midwifery education. The flexibility of the mobile learner in different learning contexts, such as the classroom, skills laboratory and clinical settings, mirrors the flexibility of mobile devices as a tool to support situated, experiential and contextualized learning (Kukulka-Hulme and Traxler, 2005). Mobile learning can create tensions within programmes, for example the constraints on the use of devices in clinical practice, but the benefits and the potential means that their use should be actively pursued. This study proposed a symbiotic approach in which mobile devices were integrated into learning. To make this happen programme leaders need to develop greater awareness of their potential and to guide and develop their use in the future. They should also be conversant with the positive impact students report when making use of mobile devices for learning (see section 4.3.4 Table 26).

## **5.6 Integrating mobile devices into a Social and Technological Ecosystem**

As the use of mobile technology and professional networking becomes established a variety of challenges are presented to learners, ones which go beyond the practical, technical and learning challenges previously raised. As the students in my study constantly changed the location of their learning environment (moving between the classroom, skill laboratory, virtual learning environment and clinical placement area) they became social learners. The process of mLearning goes beyond the individual and has the potential to establish meaningful learning through interactions within social networks. The reliance of these contemporary learners upon mobile technologies as tools for communication and connectivity automatically situates them within wider social groups and communities of learners. Some of this was missed by the students in my study who failed to realise the degree to which they were utilising their ability to learn through social connectivity.

The study highlights to me that now is the time to embrace mobile technologies and promote the idea of learning as a social activity, rather than following a pedagogical approach that is outmoded and treats the learner as an individual unconnected to those around them. I have come to see mLearning as something that emerges out of the ecology of learning which students' experience. Ecology of learning is a useful metaphor in describing how student midwives develop, learn and achieve and it does so by drawing attention to the ecosystems of everyday life. There is a symbiotic relationship between teacher, student, technology, and institution. Each layer of ecology can be separated for relevant educational theorists and software developers to design and evaluate the impact of mLearning. However, at some point these elements require reassembly (as with the influential Koole's (2009) framework) learning has to become a holistic system.

In the natural world every organism inhabits an ecosystem, which is rooted within a complex set of relationships with the inherent quality of this symbiosis the mutual beneficial relationship between each organism for survival. Using this metaphor in learning, the student is placed within an online and offline ecosystem. At the moment they interact within this system and find niches in which routines settle. In simple terms learning cannot be detached from everyday activities and neither can the student sever the connection they have with their mobile device. It is without doubt that students will create new sets of relationships with their technology in 'organic' ways, i.e. ones which arise naturally out of the experience of participation. What is important in an educational symbiosis of mobile devices is for the ecology to be modified by programme leaders and programme tutors. However they too are constrained by time and other factors and they need to be given the resources to design and plan new approaches to professional learning. Symbiotic learning is not an argument for doing away with classroom preparation. Mobile learning complements traditional didactic methods and does not replace them.

Frameworks and models that represent mLearning are useful tools to help explain and describe aspects of mLearning and the complex relationship between technology, learner and process of learning. More specifically, models allow findings from one study to be transferred to other contexts and in this case to show what needs to be in place in order to change an outcome. Models work by showing the key factors

operating within a context and inviting the reader to identify similar variables in their own context. Models can be causal (i.e. claiming cause and effect relationships) or sensitizing (inviting the reader to creatively work with the categories set out). My aim is to offer a sensitizing model, one which draws on the work of Cartwright and Hammond (2007). It is particularly useful as an approach as it balances agency (i.e. outcomes depend on the actions or strategies that learners and tutors employ) with structural opportunity and constraints.

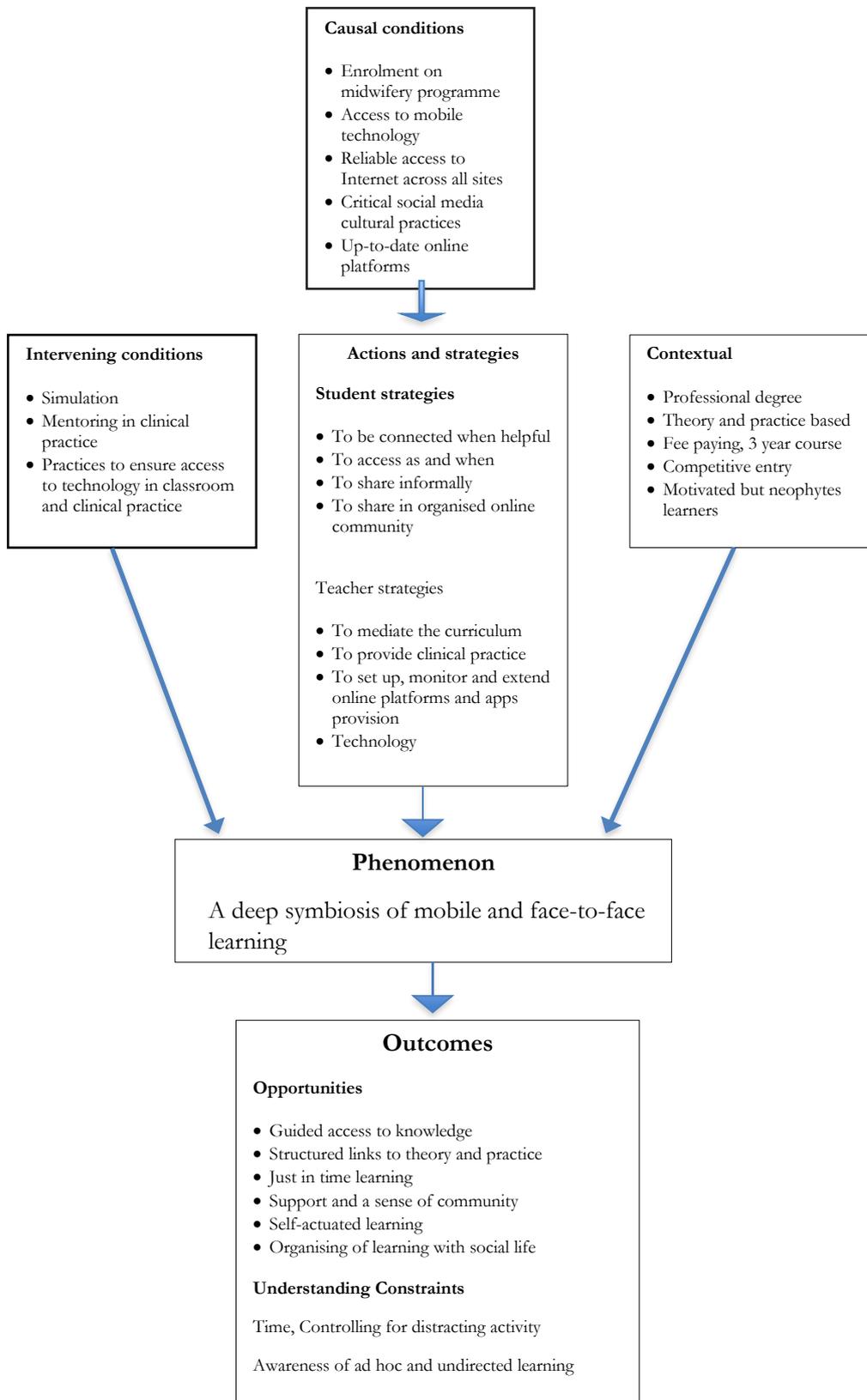
The model I present starts with the idea of a phenomenon. Here the phenomenon being promoted is a symbiosis of the social aspects (E-Social) of learning with the use of social platforms and connectivity through mobile devices.

I have described this as a symbiosis or learning ecology rather than the more usual terms mLearning in order to draw attention to the combination of community, learner choice and partnership between students and teachers. Indeed, over the past two decades various commentators and researchers in the field of education have attempted to capture and explain the term mobile learning. In essence it is a broad term, covering any teaching and learning that occurs with the use of mobile devices, connecting learners to Apps and virtual learning platforms (MoLeNET, 2010). As outlined in chapter 2 of this thesis (section 2.2) different definitions and concepts of mLearning exist. Indeed in the literature there are four associations with mLearning. The first association relates to the mobility of the technology, which led to consideration of the second, increased mobility of the student. The third, relates to the dynamic learning process and its flexibility, (Attewell and Savill-Smith, 2005). The final concept is the intricate entanglement of the students amongst the superhighway of interconnections; communication; connectivity and real world experience. These four ideas all have relevance to my study, however, mLearning too often focuses on what is happening out of the classroom when some of the most important learning takes place in particular physical locations.

I have also resisted using the term 'blended learning' although my findings describe a blended approach. The reason for the term symbiosis is that in blended learning literature there is often a distinction and a conceptual separation between classroom and out of classroom. In contrast the symbiotic approach I am advocating is about

breaking down barriers. For example an App may be used in the classroom, later in the home and then in clinical practice. The App itself is a resource that belongs to no particular location. My Social and Technological Ecosystem model of learning in Figure 5 shows what needs to be in place in order to produce the symbiosis.

**Figure 5 Social and Technological Ecosystem of learning**



The model shows causal; contextual; interventions/strategies; opportunities and outcomes in respect to a new and desired fuller symbiosis of learning combining the social and technological aspects of learning within an ecosystem of learning with mobile devices and illustrates the components within my social and technological ecosystem for learning. Thus it focuses on the conditions which shape the use of mobile devices and the strategies that teachers and students use.

**Causal conditions** can be considered factors without which the phenomenon cannot possibly emerge. In my study these include access to mobile technology, in effect for the existence of mLearning, students have to own or having access to an Internet enabled mobile device. Furthermore, for any outcome to emerge students need to enrol on the programme and students have to come to the programme with ownership of these devices and high level of confidence with the use of these devices, in other words use of mobile technology has to be a widely adopted cultural practice. Finally there has to be a minimum level of material and communication offered within the programme of midwifery i.e. resources that can be accessed. Within the Social and Technological Ecosystem **causal conditions** require all students need to have access to an Internet enabled mobile device and access to a reliable Internet connection, better than they have now. Students need to come with a more critical awareness of social media practice. Programmes must give guidance to students and provide guided worthwhile online material.

**Contextual conditions** explain where the phenomenon takes place. Important here is that the programme mixes theoretical content and practice based learning and leads to a professional degree and registration as a midwife. It is important to add here that the course is highly sought after and competitive and requires commitment and motivation to sustain the three years of training. Students are fee paying and expect to be engaged in a quality programme with diverse teaching and learning strategies. These students will graduate from university with two awards; firstly, with a BSc (Hons) Degree in midwifery and, secondly, as a qualified midwife, eligible for registration with the NMC and employment as a professional midwife. Midwifery students vary in age, educational ability and come with a range of transferable skills accredited from previous experience. However, they should be considered as neophyte as they are at the beginning of their journey into learning and developing clinical skills and competence. Within the Social

and Technological Ecosystem **contextual conditions** remain the same, this is a professional learning programme which will attract committed students and which will lead to a professional qualification. Clearly in other courses the contextual conditions will vary, my model has a particular relevance for programmes of professional preparation in which the theory practice gap needs to be crossed.

**Intervening conditions** cover the ways in which the phenomenon has been shaped by actions of the staff and students. These are not strategies as such but how the programme has been shaped by typical teaching strategies, by mentoring procedures in clinical practice and by institutional arrangements by the university in terms of supporting technology use and by the provision of material offered by teachers and indeed regulatory bodies. Within the model **intervening conditions** cover the actions and responses of institutions in to support student learning. In particular, where students do not have access to a mobile device the educational institutions should support alternatives, for example, adopt a loan system so that students. Institutions should support VLEs and provide technical support if and when Internet connections have been disrupted.

Next come the **strategies** used by students and teachers, relevant to the emerging use of mobile devices. The point here is that these strategies are shaped by the three conditions in which learning takes place. However, within these conditions teachers and students can exercise some degree of agency. Student strategies focus on being connected, using the devices for accessing information and for organising their lives and for communicating. Teacher strategies focus on providing online materials, specialist Apps, using the VLE to communicate and inform. These strategies enable an emerging symbiotic learning to happen but are restricted. To go deeper, students need to use their devices in a discriminating manner and teachers need to be aware of how students are using their devices.

Within the model lecturers' and programme leaders' strategies need to include modelling positive attitudes to the use of mobile devices and showing knowledge of available online forums and Apps. Institutions may create bespoke Apps related to midwifery, or their professional education, or they may provide guidance and exercise quality control judgements over a particular suite of Apps. Lecturers should create and help manage

tailored online forums for course members and bring participations in such forums into assessment practices. Lecturers and clinical practitioners should discuss a revised teaching and learning strategy, enabling the phenomenon to be embraced in the clinical practice setting.

**Outcomes.** This covers the consequences coming from the phenomenon and derive from conditions and strategies followed when engaging with the mobile devices. Knowledge is accessed anytime, anywhere, potentially integrating theory and practice. The teaching and learning model encourages flexibility, networking socially and professionally and an emerging sense of belonging to a community of learners and professionals. Time remains a constraint for four main reasons: it takes time to learn how to use a mobile device; then to know how and what resources should be accessed; lost time spent using the device especially if the learning is undirected; and the paradox that as students become more organised socially they may end up having less time to organise their lives and their learning than should be the case. These constraints cannot be wished away but by taking action students and teachers can mitigate them and focus instead on building a learning community.

The model being proposed offers a deep symbiosis of mobile and face-to-face learning, a blended approach in which mobile devices are integrated into many of the processes of professional learning no matter what the context. In this deeply connected model student learning is not, or not only, ad hoc and just in time but it is also structured. Students are given guidance on how to use mobile devices and pathways into exploring relevant materials. Social networks will remain informal but some networks will offer structured learning supported by lecturers. Within this ecosystem students, lecturers, clinicians and the educational institution need to work collaboratively and in partnership with each other within both the digital world and the real world. The **student** is responsible for their own learning and to take opportunities to co-design and collaborate with lectures. The **lecturer** will need to increase knowledge and use of VLE to enhance teaching and learning. Co-creation, co-design and collaboration with students, clinicians and learning technologist is essential to develop curriculum and appropriate digital learning entities for mLearning. To be effective they need to support the use of professional social media platforms for networking with peers and professionals and learn how to use the phenomenon for the optimal outcomes. **Learning technologists**

need to support both students and teaching staff. **Clinicians and peers** need to develop appropriate learning strategies, material and digital entities for mobile technologies within the clinical setting. They need to proactively bring about curriculum design and work collaboratively to identify appropriate use of tools; learn how to use tools effectively; develop greater knowledge of how and what resources should be accessed; and display responsible use of professional and personal social media platforms for networking with peers and professionals. The **educational institution** has a responsibility to provide a clear strategy for use of the phenomenon in teaching and learning. Open dialogue with lecturers, students and technologists on the role of the phenomenon in teaching and learning and how its integration can be best supported should be encouraged. This in turn will cultivate a culture of modern technology for modern students in today's modern world.

Technological pedagogical specialists should have a well-defined role within the university and be able to guide with specialist knowledge the design of reusable learning entities in multiple formats compatible for both online platforms and mobile devices. The success of a symbiotic E-Social E-Tech Ecosystem model is dependent upon them working collaboratively and in partnership with lecturers, students and clinicians to develop curriculum and appropriate digital learning entities for mLearning. In a similar manner to the outcomes afforded by this model, the actions and strategies are discretely divided into the required actions and strategies for the: student; lecturers; clinicians; educational institute and includes technology.

There is still limited understanding of how hand-held mobile devices can enhance the learner's educational experience and how we can bring about a more symbiotic approach. More research is needed; my model is an attempt to kick start the debate.

## 5.7 Chapter Summary

This chapter discussed the findings of the study in a wider context and in relation to the research questions. It addressed the research questions: what mobile devices do the learners have and what do they use them for and it discussed the position of bespoke learning Apps. The benefits of mLearning, the challenges and consequences were presented from the learners' perspective. As students embrace their mobile devices to organise both their social and educational lives they encounter various

constraints and opportunities for extending and supporting their professional knowledge and skills. Within the context of professional learning the chapter explored how mobile devices engaged the learner and how they could be integrated within professional learning for student midwives. Mobile learning is complex and has several intricate layers. A Social and Technological Ecosystem of Learning model was introduced. This model identified the elements which needed to be in place in order to develop a rich integration of tools and practices.

### **Summary points**

- All students owned a personal mobile device, which they use to multi-task, juggling their social; personal and academic lives.
- The primary use of mobile devices was for quick communication and networking through social media to collaborate and connect with peers and other communities of learners.
- Learners perceived mobile devices as useful tools for learning on the move.
- Mobile devices afford flexibility of time and place for learning (for example clinical area, at home, travelling).
- Tailor made resources including Apps can enhance the learning experience.
- Mobile learning and emerging technologies suit the diverse lives of the contemporary student.
- Opportunities should be embraced to work collaboratively and in partnership with lecturers, students and learning technologists to develop curriculum and appropriate digital learning entities to support the use of professional social media platforms for networking with peers and professionals through mLearning.
- There can and should be a symbiosis between physical in-classroom learning and mLearning, rather than seeing the latter as a replacement for the former. Technology is only part of the learning story and should complement classroom based teaching and simulation.

## 6.0 CHAPTER 6 – CONCLUSIONS

### 6.0 Introduction

This chapter provides a summary and overview of some of the key findings from the study. It is organised into seven sections starting with an introduction in section 6.1 followed by section 6.2 which returns to the research questions. Section 6.3 considers limitations of my study whilst section 6.4 outlines my study contribution. Section 6.5 presents recommendations for future teaching and learning leading to section 6.6 outlining recommendations for future research. The chapter concludes with section 6.7 my final thoughts.

This thesis was an investigation into the use of mobile technology and in particular the use of a specialised shoulder dystocia App and mobile devices to support professional learning in a BSc (Hons) Midwifery programme. The thesis took an exploratory approach drawing on ideas of crystallization (Ellingson 2009) and was qualitative in nature. This assisted me in understanding the intricate layers and relationship that existed between students, their mobile devices and experience of mLearning. Furthermore, it explored how social connectivity altered the way in which students interacted and engaged in the world and suggested why mobile devices should be embedded into the midwifery curriculum. In particular as access to the Internet becomes faster and more reliable the use of portable handheld smart phones and devices was seen as providing easy, convenient access to learning materials and communities of learners both within a social and professional context.

### 6.1 Research Questions

My thesis began from a curiosity to know more about the relationship between students' use of mobile technology and the use of mobile devices to assist learning. This led me on a journey with some unexpected directions; for example, I began with a particular interest in the use of an App but moved into trying to understand the world of the student rather than the design of learning materials. I became inquisitive as to how the use of mobile technology, in particular a smartphone, resulted in meaningful connections within an online community and the role that 'networked interactions' had

on the social aspects of 'learning'. My research questions moved over the course of the project and crystallised around an intense interest in how were mobile devices integrated into professional learning and how should they be in the future. This larger question involved me in addressing three key sub-questions.

- *What mobile devices do the learners have and what do they use them for?*
- *What do learners perceive to be the benefits and challenges of mobile learning?*
- *Does bespoke learning material have a place in mLearning?*

## **6.2 Contribution of this thesis**

My thesis offers an important contribution to the field of M learning.

First, it is a study of midwives, an area of professional practice, which is underreported in the literature. It is also an insider account of the learning that takes place and draws on knowledge and experience of the field.

Second, it provides important evidence as to how students actually use mobile devices both for participation in everyday life and for learning. It shows the benefits and shortcomings of that participation. It shows the pervasiveness of mobile devices and their importance in social identity.

Third, it is mixed methods study, which captures a great deal of data on perceptions (via survey, interviews and focus groups) as well as documentary data on learning outcomes. It combined these methods into an integrated account of the use of mobile devices.

Fourth, a key contribution is to provide an account of mobile technology, which avoids the excessive optimism, and pessimism of work in this area. For example, the early research was unduly optimistic which a feature is in all-early take-up of ICT. However this optimism can lead us to over romanticise what students are doing with their mobile tools. These accounts can also underestimate the importance of classroom learning. In contrast there is a lot of pessimistic discourse about the risks and pointlessness of ubiquitous ICT use. This is also misplaced; mobile devices can be used for learning and as a bridge for learning.

Fifth, its theoretical contribution is to provide a transferable model that describes how mobile technology can be used to develop a symbiotic approach to professional teaching and learning. This model describes the actions and conditions, which make symbiotic learning possible, setting out the steps all those connected to the programme need to undertake to integrate mobile devices more fully in the curriculum. At the same time the model recognises the constraints which might limit the idea of symbiotic learning, this is not technological romanticism. This model is relatable to other practitioners and researchers, it is sensitizing rather than causal in purpose.

### **6.3 Limitations of the study**

There are a number of limitations to this study:

Firstly, the study was restricted to a particular cohort of students, which makes it inappropriate to generalise. However this is typical of case study in which the aim is to provide relatable rather than generalisable accounts.

Second, the study was restricted by time and resource in the methods I could use. For example I would have, with more time, carried out shadowing of the students on clinical practices to see first-hand their use of mobile devices and restrictions on that use. I could also have had a deeper engagement with students' experiences of university-based learning. I wanted too to access archives of students' activity on the App but I could not do this as Apple retains the details.

Third, I am aware that the literature on technology-based learning is changing all the time. I was able to add more recent literature to the review and introduce one or two new sources in the discussion. However I would have liked to have presented a clearer time line to show the evolving narrative around mlearning. I would also have liked to have carried out a methodological triangulation, for example viewing the use of the Apps through the prism of well used models such as FRAME and MOBILearn.

## **6.4 Recommendations for future teaching and learning**

My key recommendation is that a holistic, symbiotic approach to the use of mobile devices is needed. Devices should be incorporated into institutions, and programmes of learning. To do so requires actions at all levels of a learning ecology and have been separated below in respect to the student; academics; curriculum and educational institute.

### **Students**

- Students should use devices to search for relevant material and communication forums.
- Students should become more critical and discriminating users of mobile devices. They need to control their use and not lose benefits in respect to organising work or accessing learning by excessive and almost addictive habits of use. They need to learn how to be in control of their devices.
- They should continue to be committed to achieving professional competence and be proactive in identifying links between classroom experiences and clinical practices. They should continue to use online opportunities once qualified.

### **Programme teachers and leaders**

- Teaching teams need to identify reliable Apps for learning and guide students on how to use them. They should discuss relevant criteria for selecting Apps and help students identify poor quality of misleading Apps.
- Likewise, teaching teams need to identify reliable online resources for learning and guide student on how to use them.
- Teachers should develop their own knowledge and skills in the use of mobile technologies. This does not mean that they should become learning technologists but it does mean having an understanding of online worlds.
- Teaching teams should talk to students about their relationship with their mobile devices. They should draw attention to the benefits such devices offer but also to practices which are problematic for social life and unhelpful for learning.
- Teaching teams should integrate mobile devices into the design and organisation of their programmes. For example, they could create online pre-enrolment activities

for those candidates awaiting induction to midwifery and other professional learning programmes within higher education so that students can become familiar with a mobile learning environment from the outset. They should provide information about the course, guidance to reading key documents, joining the local student midwife community via social platforms before enrollment.

- Teaching teams should communicate with clinical practitioners about the use of mobile devices, understand the constraints on the use of devices in practice locations and plan for appropriate use.

## **Curriculum**

- The curriculum should be designed to offer integration of clinical and classroom practice. Here teachers may seek the collaboration of students to co-design learning activities that make use of mobile devices.
- Assessment practice should reflect the use of mobile devices, for example participation in online community.

## **Educational Institutions**

- The learning environment must be capable of supporting a digitally enhanced curriculum. Reliable Internet connection is essential for learning across a variety of locations. Therefore, the provision of Internet services in university should be continuously reviewed and updated to meet changing demands.
- Institutions should promote a vision for teaching and learning that incorporates an emerging mobile technologies.
- Institutions should ensure that all users of mobile devices are aware of the guidance on the responsible use of social media platforms. This guidance spans across both healthcare and educational settings. Attention should be given to highlighting the types of behavior that should be avoided so as not to harm personal reputation of self and others.

## 6.5 Recommendations for future research

There are three key recommendations:

- Researchers should continue to research how students actually use technology, for example through interviewing and focus groups, but also shadowing, using research diaries and examining archives of activity. Before saying how learning should work we need to understand how it is working.
- Researchers should resist creating new romanticized theories of learning and first revisit learning theory and adapt it for new contexts.
- Researchers should critically review the frameworks used to explain mobile learning and consider how to adapt models such as my own symbiotic learning framework.

## 6.6 Final thoughts

We now live in a rapidly transforming society where digital technologies are shaping the way that we all function and learn. My study provided me with important findings in relation to the interaction between learner-content, learner-teacher and learner-learner but only touched the surface of what could have been achieved. In my experience as an academic clinical midwife (25 years) I have seen and been involved in several changes in the midwifery curriculum and I am currently involved in supporting the re-design of the curriculum that should best prepare and shape the midwives of the future. This is an ideal time for me to influence the way in which midwifery education can continue to be progressive and response to the way in which learners use mobile devices to function on a daily basis.

The use of technology and networking capabilities beyond the classroom are constantly expanding. Mobile technologies and wireless connectivity are ubiquitous and for millions of people permeate their everyday lives. Integration of a mobile learning strategy into the midwifery curriculum needs to reflect the students' world and be delivered to them in a manner that they understand and can manage through mobile devices and technology.

It is my opinion that learning through mobile technologies allows the student to engage with content and develop skills they are expected to learn in more ways than ever before so we need to embrace it and integrate versions of mLearning into contemporary

education. As I have taken this journey through my thesis and reviewed the pedagogical approaches to learning, it strikes me that over the past decade whilst mobile devices and technology have become faster, more reliable and ubiquitous, it (mobile technology) has not changed what it takes to learn. Rather, what has changed is the access to a variety of social learning environments. My final thought is that technology is a tool but it is what learners do with that tool that gives meaningful context to how technology can be used to enhance learning that counts!

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## APPENDIX 1

A task model for mobile learners (Sharple, Taylor and Vavoula, 2005)

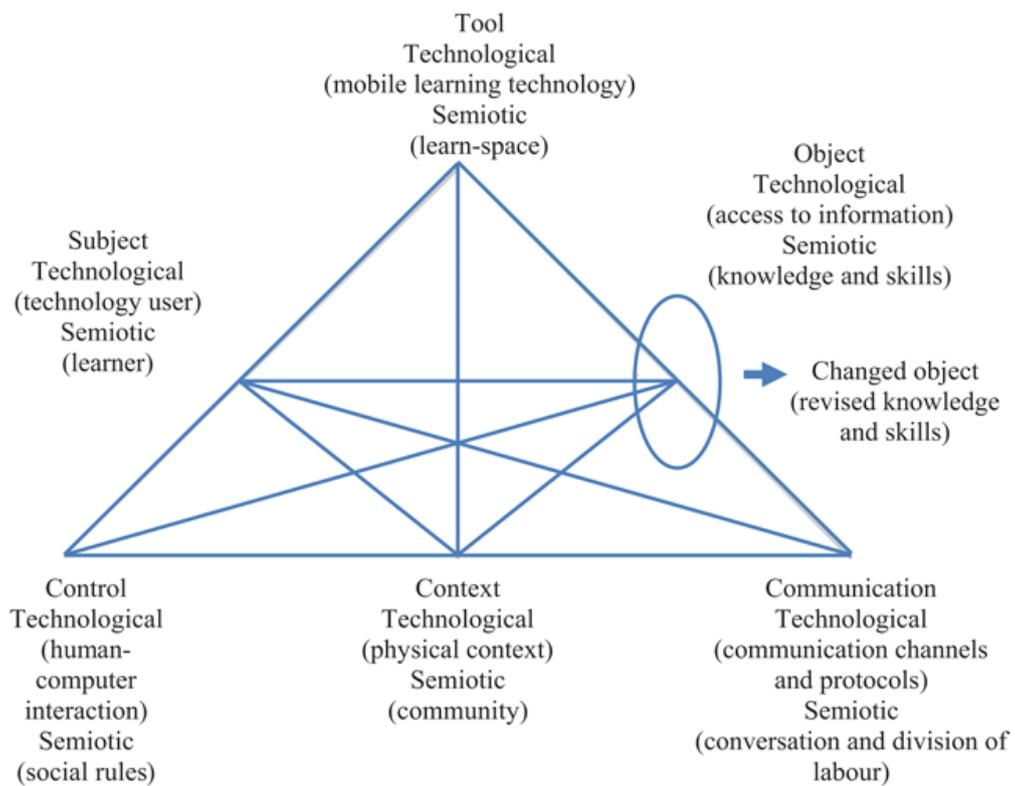


Figure 1 - Mobile learning episodes in the semiotic space (Vavoula, 2005)

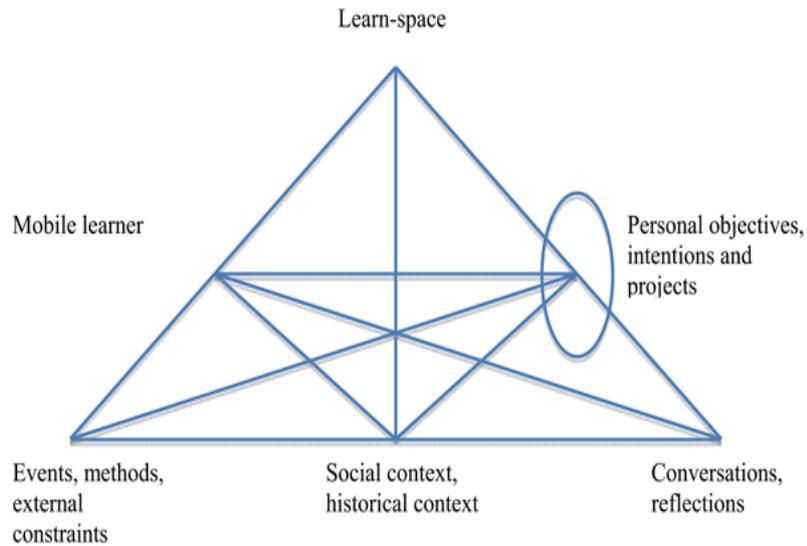
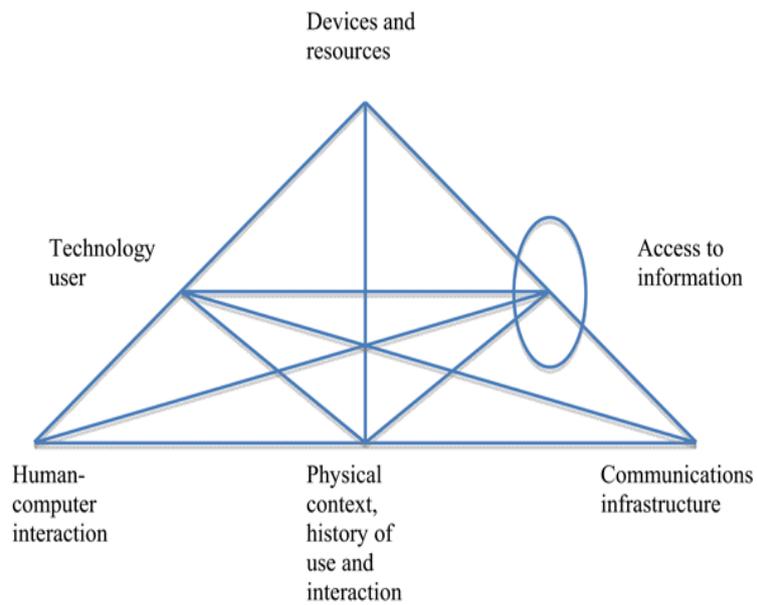


Figure 2 - Mobile learning episodes in the technological space (Vavoula, 2005)





Collette Clay - Ethical Approval.pdf

**Application for Ethical Approval for Research Degrees  
(MA by research, MPHIL/PhD, EdD)**

**Name of student**

Collette Clay

MA By research
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EdD
-----

PhD ✓
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**Project title:** Exploring the challenges of emerging technologies and connected learning for students on professional educational programmes leading to registration with a Professional body.

**Supervisor:** Mr M Hammond

**Funding Body** (if relevant): Coventry University, Faculty of Health and Life Sciences (HLS) (employer)

Please ensure you have read the Guidance for the Ethical Conduct of Research available in the handbook.

**Methodology**

Please outline the methodology e.g. observation, individual interviews, focus groups, group testing etc.

The research will involve a case study approach the focus of which is to explore the student midwives experience with engaging with a multi media application and emerging technologies for learning. The multi media application of choice is a specifically designed teaching and learning native application (App) for an ipod; iphone; ipad device. The content of the App is instructional on how to recognise and manage the obstetric emergency of a shoulder dystocia. Several features are contained within the App and a menu is available to select learning assets; these include:

- Lecture recordings
- Illustrations (bespoke)
- Skills Drill (narrated animation, movie and mnemonic)
- Glossary of key terms
- Self-test area
- Additional information (Web resources and reference materials)

The methodological design of this qualitative case study can be viewed as an interpretive or social constructivist approach as the researcher has a personal interest and interaction with the case. The methodology of choice is fundamentally non-experimental and in keeping with case study research

intends to combine both qualitative and quantitative methods nested together to collect data aimed at developing disciplinary specific knowledge in relation to the application of technology enhanced learning. The data collecting methods selected for this study are divided into three phases:

- *Phase 1: Survey Questionnaires (pre and post teaching application)*
- *Phase 2: Nominal Group Technique (NGT)*
- *Phase 3: Impact Analysis*

Phase 1: It is my intention that the survey questionnaire will act as a vehicle to explore some of the issues associated with enhanced learning technology. This will include how the students facilitate their learning using technology enhanced learning tools. It will also explore how the use of m-learning can enrich student midwives to acquire and develop knowledge and skills and be connected as a community. The format of the questions will be open and closed, with space provided for free-text responses that will provide both qualitative and quantitative data. Participants will be given the survey questionnaire prior to and following their engagement with the teaching and learning App.

Phase 2: The Nominal Group Technique will be used to increase the depth and scope of discussion and elicit the views or perceptions of the participants in relation to the subject. The group size for NGT should be no less than three participants to a maximum of twelve. Therefore for practical and resources the participants be divided into three equal groups (Group A. n= 12, Group B. n= 12 and Group C. n= 12). In order to reduce inconvenience to the participants the researcher will liaise with the midwifery course team and negotiate access to the students' timetable and request access during their required attendance at the university to host the NGT. Data from the NGT will be captured with consent verbatim on a recording device and discussion board (graffiti wall). An external verifier will be used to facilitate the NGT (further explained under the section Integrity).

Once the survey questionnaire and NGT have been completed students will be provided with a unique redeemable access code that permits them to download a teaching and learning application (App) from iTunes for free onto a mobile device. Students will be encouraged to use the App for a period of four weeks before entering phase 3 of the study. To assist in monitoring the students activity with the App they will be provided with a simple easy to use 'matrix' to complete indicating the resources used within the app, frequency of using the resources within the app and time and place of using the app.

Phase 3: For the impact analysis participants will be invited to perform a 'skills drill' related to managing a shoulder dystocia where an evaluation tool will be completed to monitor their performance of the skills. A specifically designed marking criterion will be used to record performance. Following this the participants will be asked to complete the post survey questionnaire as the final data collection.

### Participants

Please specify all participants in the research including ages of children and young people where appropriate. Also specify if any participants are vulnerable e.g. children; as a result of learning disability.

This is a purposive sample as the participants are being selected deliberately to reflect the professional group of student midwives and characteristics of interest. The research will involve collecting primary data from a cohort (group) of student midwives (n=36) undertaking a BSc (Hons) Midwifery Degree. The students attend the Faculty of Health and Life Sciences (HLS) at Coventry University. This cohort of students is in year two of their Degree programme of study. None of the participants will be exposed to any known environmental, physical, psychological or emotional distress. All participants are above 18 years of age and are expected to range between 19 years of age to forty-five years of age. This cohort have been selected as at this stage of their studies they are required to gain knowledge and demonstrate proficient skill acquisition and performance of managing obstetric emergencies for example a shoulder dystocia. There is an opportunity to access a cohort (group) of student paramedics (n=30) undertaking a BSc (Hons) Paramedic Science Degree programme. These students are also in their second year of their studies and are deemed appropriate as they will be undertaking a module of learning related to obstetric emergency training delivered by the academic midwifery lecturers.

Consent – will prior informed consent be obtained?

From participants?

**YES/NO**

From others?

**YES/NO**

Explain how this will be obtained. If prior informed consent is not to be obtained, give reason:

Participants will be informed of the purpose of the research study and what it involves in advance. Opportunity will be given to obtain written informed consent to participant in the study and assurances given that confidentiality will be maintained.

The Head of the Nursing and Midwifery Department is aware of the study and has given permission for the research to be conducted following approval from the HEI where the researcher is a student. I have spoken with the Faculty Research and Ethics Registrar who has given assurances that there is no conflict within the Faculty for me to undertake the research study and that approval from the HEI of study has to be sought through the Ethics approval panel and appropriate process. It is my understanding that I do not have to complete the Ethics approval process at the HEI where the study will be conducted; however a risk analysis and 'desk top' declaration will be made on successful approval from the University of Warwick.

### Respect for participants' rights and dignity

How will the fundamental rights and dignity of participants be respected, e.g. confidentiality, respect of cultural and religious values?

This research study will not raise particular issues and have no direct connection to the participants' religious values. Participants will be approached in a sensitive manner, reassurance of anonymity and confidentiality upheld during and after the research.

#### Privacy and confidentiality

How will confidentiality be assured? Please address all aspects of research including protection of data records, thesis, reports/papers that might arise from the study.

Confidentiality, security and retention of research data are of primary importance to the researcher. Participants' names will be anonymous and they will not be identifiable. Data collected will be anonymised and stored in a secure location. Key codes and an encrypted data storage device (USB) will be stored at a separate location to interview and other data.

Prior to consent participants will receive information about the research and only then will informed consent be obtained from participants. The information provided would clearly outline the purpose of the study, the responsibility of the researcher, the expectations of the participant and most importantly how anonymity will be maintained. An opt-in/or opt-out approach will be utilised, as part of the process of consent and all participants will be given the option to remove themselves from the study at any time without any prejudice or negative impact upon them as an individual or their studies.

For the process of the Nominal Group Technique (NGT) the researcher will sensitively divide the participants into appropriate sized groups (n=12) and ensure that group members are cohesive. This is essential as the researcher is aware that information shared within the group will be inherently shared with other group participants during the NGT and the participants should not be made to feel uncomfortable. As the purpose of the group is based on a teaching and learning intervention then any serious invasion of privacy should not occur. Participants will be reassured that they belong to the shared milieu and that the groups will not be identifiable when the data is presented.

#### Competence

How will you ensure that all methods used are undertaken with the necessary competence?

The researcher can provide reassurance that she has been involved and undertaken previous primary research. The researchers profile can be viewed if required by the ethics approval panel and evidence produced that the researcher is up to date with research training within her current employment.

The researcher is a member of the Children and Families Research group at Coventry University and can and will if necessary gain guidance from the Associate Dean of Research based within the Faculty (Professor Jane Coad).

### Protection of participants

How will participants' safety and well-being be safeguarded?

The data gathered addresses attitudes and experiences of students engaging with technology enhanced learning applications and are not expected to involve questions of a particularly sensitive or personal nature. If for any reason personal disclosures unexpectedly occur the researcher will stop the process in which it occurs.

### Child protection

Will a DBS (Disclosure and Barring Service formerly CRB) check be needed?

There are no child protection concerns for this research activity and therefore a DBS will not be required.

Yes/No (If yes, please attach a copy.)

### Addressing dilemmas

Even well planned research can produce ethical dilemmas. How will you address any ethical dilemmas that may arise in your research?

As a healthcare professional, registered on part 1 of the Nursing and Midwifery Council's (NMC) Professional Register it is obligatory for me to act in an ethical and professional capacity at all times, in accordance with the Professional Code of Conduct (NMC, 2015).

Appropriate applications will be made to both the HEI where the researcher is a student and the HEI where the cohort of participants are embedded. A risk analysis will be completed to consider the potential harms to the participants; although this is considered to be minimal. The researcher is employed within the Institution from which the sample will be recruited and is therefore considered an 'insider' which has clear advantages and disadvantages to the study. In an attempt to reduce the perceived researcher bias the researcher can offer reassurance that she does not engage with teaching and learning with this cohort on a regular basis and therefore the bias should be removed and the potential for a 'halo effect' should be reduced.

If any ethical dilemmas arise then participants will be reminded that as part of the process they are able to opt-out and remove themselves from the study at any time without any prejudice or negative impact upon them as an individual or their studies.

### Misuse of research

How will you seek to ensure that the research and the evidence resulting from it are not misused?

There are no reasons why I can not guarantee the full security and confidentiality of the research data collected. No personal data or confidential data will be collected during or at the end of the project, other than in a fully anonymised form.

#### Support for research participants

What action is proposed if sensitive issues are raised or a participant becomes upset?

The nature of this study should not give rise to any sensitive issues being raised that will lead to the participant becoming upset or distressed. However, as a precaution all participants will be offered support from the student's counselling services during the study. If at any time participants become upset the researcher will stop the process and provide appropriate support to the participant.

#### Integrity

How will you ensure that your research and its reporting are honest, fair and respectful to others?

To add rigor, objectivity, fairness, equity, and transparency an external verifier will be appointed to assist with each phase of the study. The external verifier will be a senior lecturer (Dr Carol Chamley) in the department in which the researcher works but external to the midwifery team. The external verifier is established within the Faculty of HLS and actively engages with research and the Children and Families Research group. The external verifier is experienced in using the Nominal Group Technique and is willing to share her research profile or/and CV with the Ethical approval panel if required.

A small pilot study will be conducted with a volunteer sample of students (n=4) to test the questions within the survey questionnaire to ensure that they are unambiguous and meet the needs of the research. The NGT will also be piloted with this group to test the question for clarity. This will provide some insight into potential problems that could be avoided with careful planning and restructuring of questions. The external verifier will be invited to participate in the pilot NGT to ensure that she is familiar with the question and provide objectivity within the process.

What agreement has been made for the attribution of authorship by yourself and your supervisor(s) of any reports or publications?

Where an opportunity arises for a publication or output from this research study my supervisor is invited to contribute and authorship attributed accordingly.

#### Other issues?

Please specify other issues not discussed above, if any, and how you will address them.

I confirm that I have answered all relevant sections in this form honestly.

I confirm that I will carry out the research in the ways described in this form. I will immediately suspend research and request a new ethical approval if the study subsequently changes the information I have given in this form.

Research student: *Collette Clay*

Date: 02.06.2015

Supervisor

Date

Action

Please submit to the Research Office (Louisa Hopkins, room WE132)

Action taken

Approved

Approved with modification or conditions – see below

Action deferred. Please supply additional information or clarification – see below

Name

Date

Signature

Stamped

Notes of Action

**SEE PDF for ORIGINAL DOCUMENT**



## CONSENT FORM

**Your copy: Please retain.**

**Title of Project: How do learners make use of mobile technology and with what consequences?**

**Project summary: The purpose of this study is to investigate what contribution mobile technology has to learning and how learners respond to using new technologies to enhance their learning.**

**Participant Identification Code for this study: .....**

**Name of Researcher:**

Mrs Collette Clay

- I confirm that I have read and understood the participant information sheet for the above study and have had the opportunity to ask questions what my contribution.

Yes	No
-----	----

- I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason

Yes	No
-----	----

- I agree to take part in the focus group

Yes	No	NA
-----	----	----

- I understand that all the information I provide will be treated in confidence.

Yes	No	NA
-----	----	----

- I agree to the interview being tape-recorded.

Yes	No	NA
-----	----	----

- I agree to the use of and understand that any quotes to be used as part of the research project will be anonymous.

Yes	No
-----	----

- **I agree to take part in the above study**

Yes	No
-----	----

\_\_\_\_\_  
Name of Participant                      Date                      Signature

\_\_\_\_\_  
Name of researcher                      Date                      Signature

taking consent:

Researcher contact details: Coventry University, Faculty of Health and Life Sciences, [REDACTED]

[REDACTED], Telephone: [REDACTED] Email: [REDACTED]

## Research Participant Reusable Learning Object Consent Form

**Title of Project:** How do learners make use of mobile technology and with what consequences?

**Project summary:** The purpose of this study is to investigate what contribution mobile technology has to learning and how learners respond to using new technologies to enhance their learning.

### Guidelines for Consent to Photographs/Recordings for Teaching and Learning: Service Users and Patients

#### GUIDELINES FOR STAFF

##### 1.1 Before the photo/recording:

Staff must ensure that the individual understands:-

- i the purpose of the photo/recording;
- ii who will be allowed to see or hear it;
- iii the circumstances in which it will be used;
- iv the arrangements for storage;
- v how long photo/recordings will be kept;
- vi whether copies will be made and in what format.

1.2 Withholding consent or withdrawing consent before, during and after the photo/recording will not cause any detriment to them.

1.3 Sufficient time will be given to read and discuss explanatory material and consider the implications for signing the consent form.

1.4 Guidance and support regarding their role in the making of the photo/recording will be given if necessary

1.5 Explanatory material is available in language that is easily understood and translated if necessary.

1.6 If participants wish to restrict the use of the material, this should be recorded in writing and attached to the consent form.

##### 2.1 During the Photo/recording:

2.2 The participant has the right to stop the photo/recording for any reason.

- 2.3 Appropriate support must be given by the member of teaching staff if photo/recording is seen to be having an adverse effect on the participant.
- 3.1 **After the photo/recording has been made:**
- 3.2 The participant must be shown or listen to the finished photo/recording
- 3.3 Recordings are used only for the purpose for which the participant has given consent.
- 3.4 If the participant wishes to withdraw consent, they should be assured photo/recordings will not be used and the photo/recordings will be erased/destroyed as soon as possible.
- 3.5 Appropriate secure arrangements will be made for safe storage of photos/audio tapes/recordings
- 3.6 Time must be allowed to discuss the photo/recordings and give appropriate support.

**Further information/Key contact details of researcher**

If you would like to know about this study then you are invited to contact the Principal Investigator Mrs Collette Clay either in person, by telephone or email.

Mrs Collette Clay

Senior Lecturer in Midwifery

Senior Fellow Higher Education Academy

Coventry University,

Faculty of Health and Life Science,

School of Nursing, Midwifery and Health

Richard Crossman Building, [REDACTED]

Telephone: [REDACTED], Email: [REDACTED]

## **GUIDELINES FOR THE PARTICIPANTS**

I am hoping to capture the place in where students/learners use mobile technologies for their learning.

These photos and/or audio recordings will become part of the data

**Title of Project:** How do learners make use of mobile technology and with what consequences?

**Project summary:** The purpose of this study is to investigate what contribution mobile technology has to learning and how learners respond to using new technologies to enhance their learning.

The video/audio tapes will be of you talking about your experiences. All photo/recordings are carried out according to guidelines issued by the Faculty of Health and Life Sciences.

Only those persons you have agreed to will view or hear the photo/recordings for learning and teaching purposes.

The photo/recordings will be stored securely within the University's Centre of Excellence in Learning Enhancement , and be used for the period to which you have agreed. After the agreed period of use, the photo/recordings will be destroyed

You may withdraw your consent before, during and after the photo/recording or ask for it to be edited if necessary. If you decide you are not happy for the photo/recording to be used it will be destroyed.

**Consent Form for Photo/Recording for Teaching and Learning**

**To be completed by the participant**

I have read the information sheet and been given the opportunity to ask questions regarding this information. I give my permission to be recorded.

NAME: -----

CONTACT DETAILS:

\_\_\_\_\_  
-----  
-----

Signature of Participant before the recording \_\_\_\_\_ Date

\_\_\_\_\_

**To be completed by member of staff**

I have discussed the Guidelines as specified, with the above participant.

NAME: -----

Signature of Researcher/ University Staff \_\_\_\_\_ Date

\_\_\_\_\_

**Statement of interpreter (if necessary)**

I have interpreted the information to the above to the best of my ability and in a way in which I believe s/he can understand.

NAME: -----

Signature of Participant \_\_\_\_\_ Date

\_\_\_\_\_

After viewing/listening to the photo/recording, I am willing/ I no longer wish for the photo/recording to be used.

I agree for the photo/recording to be used for a period of \_\_\_\_\_ .

I have received information on the possible future uses of the photo/recording. I agree to the use of and understand that any quotes to be used as part of the research project will be anonymous.

NAME: -----

Signature of Participant \_\_\_\_\_ Date

\_\_\_\_\_

## **Participant Information Sheet**

**Research Title: How do learners make use of mobile technology and with what consequences?**

### **Information about the study**

You are invited to take part in a study investigating the contribution mobile technology has to learning and how learners respond to using new technologies to enhance their learning. The study is being undertaken by Collette Clay Senior Lecturer in Midwifery at Coventry University as part fulfillment of a PhD programme. The following information should answer any questions you may have about your participation and involvement in the study.

### **What is the purpose of this study?**

The purpose of this study is to explore the views, experiences and opinions of students/learners who currently use mobile technologies to enhance their learning.

### **Why have you been invited to participate in this study?**

You are invited to participate in this study because you are a student/learner currently undertaking a programme of learning at the University.

### **What will the study involve?**

If after reading this information you agree to participate you will be asked to contact the Researcher via email on [REDACTED] so that you can be invited to attend the focus group and be given further information on the stages of the project. You will be invited to be involved in one or all of the following:

*Stage 1 and Stage 2: Survey Questionnaires*

*Stage 3: Focus Group*

*Stage 4: Artefacts, logs and Documentary data*

### **Do I have to take part in this study?**

Taking part in this study is completely voluntary it is up to you to decide whether you wish to take part. You can withdraw from the study at any time without any questions.

### **What are the risks associated with this project?**

There are no expected risks associated with this study.

### **What are the benefits of taking part?**

Your opinions about mobile technologies and learning are important. Taking part in the study will provide crucial information that can impact upon future learners and assist in changing the landscape of emerging technologies within Higher Education Institute (HEI).

**Can I be identified in this study?**

This is an anonymous study; therefore your details will remain confidential. You will not be identified by name at any stage in this study. However, if you agree to the use of a photograph as an artifact for the study you will be invited to complete an additional consent form. Reassurance is given that the artifact/photo is only used for the purpose for which you have given consent.

**How will the Data collected be protection & confidentiality maintained?**

This is an anonymous study; therefore your details will remain confidential. Data will be stored securely on an encrypted USB memory stick that is password protected, will be stored in a lockable cabinet at the researcher's place of work.

Upon request, a copy of the transcription from the focus group will be provided to each research participant to validate that the information provided during the focus group session is accurate. On completion of the study all data will be destroyed. However, the use of photographs may be retained with consent for use in published or professional conferences. At no time will research participants be identifiable within a written report.

**What will happen with the results of the study?**

The results of the study will be analysed and presented in an academic report within a Thesis of the researchers PhD. Key findings from the research may also be published in a scientific/educational journal and presented at professional/ educational conferences.

**Further information/Key contact details of researcher**

If you would like to know about this study then you are invited to contact the Principal Investigator Mrs Collette Clay either in person, by telephone or email.

Mrs Collette Clay

Senior Lecturer in Midwifery

Senior Fellow Higher Education Academy

Coventry University,

Faculty of Health and Life Science,

School of Nursing, Midwifery and Health

Richard Crossman Building, [REDACTED]

Telephone: [REDACTED], Email: [REDACTED]

**Thank you for your time**

APPENDIX 7

Coventry University  
Faculty of HLS  
OSCE Marking Criteria: Managing Shoulder Dystocia

Criterion	Expected answer	Mark awarded
<b>Risk factors for shoulder dystocia</b>	Previous large baby >4K Increased BMI Syntocinon augmentation (never previously needed ?OP ?big baby) Large for dates on customized growth chart Slow progress in 1 <sup>st</sup> stage	(10)
Management of shoulder dystocia (HELPERR)  H	Use HELPERR mnemonic Call for additional help: (depending upon who is present) Senior Midwife Senior Obstetrician Senior Paediatrician (head to body interval delay pH drops 0.04 per minute) Scribe	(10)
E	Evaluate for episiotomy Will not alleviate problem as bony obstruction at pelvis inlet not soft tissues at outlet May be delayed until after McRoberts performed or position changed Should be performed prior to internal manoeuvres	(5)
L	Legs into McRoberts 40% will deliver with McRoberts Take legs out of lithotomy and straighten before placing into McRoberts Flattens sacral promontory increasing AP diameter Alters angle of inclination Posterior shoulder may be pushed into sacral hollow (past obstruction) Flexes fetal spine	(15)
P	Suprapubic pressure 70% will deliver with these two manoeuvres combined Rubin I Behind fetal anterior shoulder, above symphysis pubis Angle 45 degrees to reduce bisacromial diameter Continuous pressure 30 seconds Rocking 30 seconds (intermittent pressure)	(10)
E	Enter (may wish to demonstrate with doll and pelvis) Enter at either 5 or 7 o'clock (posteriorly) Sacral hollow where most room and episiotomy performed Fingers to posterior aspect of anterior shoulder (Rubin II) Try to rotate, try to deliver	

	<p>If does not move or undeliverable add other hand to the anterior aspect of posterior shoulder and attempt to rotate (Woodscrew)  If unable to access anterior shoulder or unsuccessful Reverse Woodscrew  Attempt to deliver when there is movement</p>	(15)
R	<p>Remove posterior from vagina  Enter at 5 or 7 o'clock this time in front of the baby's body  Work fingers down to the antecubital fossa and attempt to flex the infant's arm across the chest and sweep out of the vagina  Anterior shoulder should drop down and delivery should be achievable  Infant may rotate</p>	(10)
R	<p>Roll onto all fours  Sometimes called Gaskin manoeuvre  Simulates squatting  Increases AP diameter  Difficult with dense epidural or very increased BMI</p>	(10)
Documentation and debriefing	<p>Careful documentation  Timing of head delivered  Timing of body  Manoeuvres performed by who, times and for how long  Position of body at delivery  Clinical incident report (risk management)  Debriefing in offered</p>	(5)
Complications	<p><i>Maternal:</i>  Soft tissue injuries, extension of episiotomy, rectal mucosa disruption, 3<sup>rd</sup> / 4<sup>th</sup> degree tears  Haemorrhage  Symphyseal separation  Uterine rupture  Psychological trauma</p> <p><i>Fetal:</i>  Brachial plexus injuries, Erbs or Klumpkes palsy  Development delay (hypoxia)  Fractures of humerus and clavicle (damage to underlying vasculature)  Death  Last resort manoeuvres</p>	(10)

Name of student: .....

Name of Marker: .....

Name of Moderator: .....

Mark awarded: .....

Feedback:

**Research Title: How do learners make use of mobile technology and with what consequences?**

**Survey 1**

Mobile, wireless and handheld technologies are being used to transmit and deliver rich multi-media content relevant to your pre-registration midwifery programme. Your comments are valuable and will contribute to new information and learning technologies for future cohorts of student midwives. In order to enhance the quality of the data retrieved and facilitate reliability and direction on areas that may need to be improved upon for future activities this evaluation has been divided into three sections: 1 - communication and technical aspects, 2 – Using the Shoulder Dystocia Application and 3 - personal learning.

**Section 1: Communication and technical aspects**

1. Which of the following Internet-enabled mobile devices do you currently use? Select all that apply.

iPhone

iPod Touch

iPad

Android phone

Android tablet

I do not have a mobile device with Internet capabilities

Other (please specify)

If you selected other, please specify

---

2. How many applications have you downloaded to your mobile device? Circle all that apply.

0

1-3

4-6

7-9

10-12

13 +

3. If you have downloaded applications to your mobile device, how many are related to education and learning? Circle all that apply.

0      1-3      4-6      7-9      10-12      13 +

4. To what degree do you use your Internet-enabled mobile device for the following activities? Please tick the relevant column/s.

Activity	Always	Frequently	Occasionally	Rarely	Never
Social networking					
Reading (e-books, articles)					
Receiving news alerts					
Accessing email					
Text messaging					
Searching for information					
Uploading content					
Watching videos					
Playing games					
Listening to music					
Completing coursework					
Participating in lectures					

5. Do you have Wi-Fi access where you live?

Yes

No

6. When and where do you find yourself using your mobile device? Please briefly describe the situation/place/environments in which you use it in the space provided below:

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7. From where do you most often use the device to access teaching materials?

Home

University campus

NHS Trust placement

8. Do you use a mobile device when out in the clinical area?

Yes

No

If so, which Trust are you attached to?

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9. If you have used a mobile device to access teaching materials did you experience any difficulty in finding WiFi access to use the device in your local NHS Trust

Yes

No

10. What type of technologies do you use to connect with colleagues/peers/friends? Please tick the relevant column/s.

<b>Technology</b>	<b>Always</b>	<b>Frequently</b>	<b>Occasionally</b>	<b>Rarely</b>
Skype				
Face Time				
Email				
Text messaging				

Other, please state				

11. What library/academic information or resources have you tried to access using your mobile device? Select all that apply.

Search library catalogue

Search library databases

Request an item through interlibrary loan

Access web sites

Access Government papers

Other (please specify)

If you selected other, please specify

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12.

**Shoulder dystocia App**

Please indicate on the following scale the extent to which the following statements apply to your experience of using the shoulder dystocia app.

**KEY - Please circle applicable numerical response**

**1 = Strongly disagree**

**2 = Disagree**

**3 = Neither disagree nor agree**

**4 = Agree**

**5 = Strongly agree**

	1	2	3	4	5
The App was easy to navigate					
The information contained with the app was useful					
The sequencing of information was appropriate					
The video material within the app accurately reflected the authenticity of the competences/skills being developed					
The app addressed my learning needs					
I would like more Apps to address the management of obstetric emergencies					

I would like more Apps for learning	

Which of the materials on the device did you utilise most often?  
 What other materials would you like to see developed in the future?

Please indicate on the following scale the extent to which the following statements apply to your experience of using a mobile device for learning.

**KEY - Please circle applicable numerical response**

- 1 = Strongly disagree**
- 2 = Disagree**
- 3 = Neither disagree nor agree**
- 4 = Agree**
- 5 = Strongly agree**

	☹				☺
	1	2	3	4	5
<b>Mobile learning has encouraged me to reflect on the learning material</b>					
<b>Mobile learning has encouraged my ability to be an independent learner</b>					
<b>Mobile learning affords flexibility in time and place of learning</b>					
<b>Mobile learning has accommodated my individual diversity and learning style</b>					
<b>Mobile learning and the mobile learning device has sustained my interest in learning</b>					
<b>I would take the opportunity to learn other skills supported by a mobile learning device</b>					

What challenges does learning and discovery through mobile devices have when compared with traditional methods of discovery?

What do you appreciate the most about using applications or the Internet on your mobile device?

What is the most frustrating thing about using applications and/or the Internet on your mobile device?

**Thank you for taking the time to share your experience and completing this questionnaire**

## APPENDIX 9

### Focus Group Guidance

**Research Title:** How do learners make use of mobile technology and with what consequences?

### Focus Group Topic Guide

You are invited to this focus group to share your views and experiences on the use and role of mobile learning and mobile technologies in education.

**Duration:** 1 hour

**Ground rules:** confidentiality and respect, relaxed environment with discussion.

Session will be recorded and later transcribed. A copy of the transcription can be supplied if requested.

**Ice breaker:** each participant will be asked to introduce themselves and the facilitator will lead with the Turning Point activity.

Turning Point equipment will be able to capture an overall sense of what the participant's use mobile learning for in relation to supporting their learning and education. This application stores the results and can the data captured can then be utilized by the researcher.

**Photographs:** If willing and with consent the group will be encouraged to have a group photo and a photo of using a mobile device which may be used later as an artifact.

**Environment:** classroom, tables in non-threatening arrangement, chairs, well ventilated, refreshments provided.

**Resources:** camera, or personal phone to capture photograph, flipchart paper, marker pens, digital board (for comments) and Turning point equipment (software pre-loaded on computer of room to be used).

### Format:

- Welcome participants
- Invite to be seated at pre-arranged table
- Ice-breaker activity
- No more than 5 participants at each table
- Introduction by facilitator and an overview of the session
- Reveal the first question and give the students 2 minutes to contemplate the question (without discussion)
- Then give 8 minutes for discussion around the table and opportunity to write comments on the paper provided on the table.
- After this time reveal the next question and repeat until all questions have been presented.

A recording device will be in the room to capture (with consent) the discussion and dialogue when participants are invited to feedback and discuss the questions raised.

### Key Questions

Questions for the focus group
Q1. What is the main purpose of your chosen mobile device?
Q2. What type of emerging technologies do you use to support your learning?
Q3. How, if at all does the use of mobile device support or influence your learning?
Q4. How do you think mobile technology contributes to your learning?

**Triggers:** From your experience can you explain how you

Advantages to mobile education:

- mobile learning supports a wide variety of conceptions of teaching
- mobile learning uniquely places the support where the learner is situated
- mobile learning makes learning personal by increasing independence, responsibility and attitudes to learning.
- It recognises diversity and difference in the ways that individuals learn
- Mobile learning affords flexibility of time and place that learning occurs
- Mobile learning enhances authenticity with the material uploaded onto the mobile device

It aids reflection 'in-action' and combined with the use of e-Portfolio technologies encourages spontaneous reflection an

## APPENDIX 10

### Guidance and Questions for Face-to-Face interviews

Question	Prompt (only if required)	<i>The answer could lead to another series of questions or prompts</i>
1. Can you tell me what type of communication technology or devices you have or you use in general	Smart-phone Android phone, iPhone, iPod iPad, tablet	
2. What do you use your device for?	Calls, texts Using apps, accessing Internet Streaming music, videos etc Shopping, researching holiday deals, booking accommodation, booking restaurant times. Photos/ built-in camera	What type of applications do you use on your device?  What type of apps for learning do you use?
3. Can you tell me about the social use of this device?	Communicating with friends/family Using Face time, Facebook	Has using this technology changed the way you communicate with friends and family?
4. How often do you find yourself using the device?	Frequency: daily, before or after placement, in the evening, throughout the day?	Do you use the device every morning, every evening, at any opportunity  What is important to you when using the device?
5. What do you think the attraction is of this device?	On trend to use a device Easy to transport Easy to use	How important is it to you to feel connected by using a device?
6. Can you tell me where you are when using the device?	Are you at home, clinical placement, university campus, using public transport, in a park	Can people contact or reach you most any time with the use of the device?  Do you feel it is positive or negative that you can be reached at any time?
7. Can you tell me about the non-learning (informal) use of the device?	Networking, blogging, reading, tweeting etc Blogging, reading, what do you read, browsing, tweeting etc	Did you come across important information related to midwifery whilst browsing other items?

8. Can you tell me about the formal use of the device for learning?	Looking at reference pages, midwifery education, saved files, searching for midwifery related information Specifically targeted material	Do you feel connected as a community when using device or isolated?
9. Do you use the device to assist your learning, if so can you tell me about this?	Accessing learning apps, accessing online library, searching for journal articles Peer network for online collaboration	Does using a device change the way in which you learn or access material for learning/knowledge?
10. Has using the device/technology changed the way in which you learn?	Ease of use to access Internet Ease of use to access learning materials	Does it make it easier to access material? Is it that material is available at a time and place where and when you need it?
11. Can you think of something that you learnt using the device that you would not have learnt in the classroom	Further reading Clinical skill	Does the use of the device and access to learning material reinforced a topic that you are interested in?
12. What do you see as opportunities for learning with the device?	Aid memoire Access to learning materials at anytime Access to learning materials in any location	Do you think that you learn anything when using the device to access information?
13. Can you tell me what is good/best thing about using the device?	Keeps you connected Can be used at anytime, anyplace with Wi-Fi connection	
14. Can you tell me what you find most frustrating when using the device?	Connection to Internet Wi-Fi access	What type of price do you pay monthly to use 3G or 4G to be connected?
15. What do you see as difficulties/challenges for learning with the device?	Internet access Ability to use the device Lack of knowledge on how to use the device for accessing learning materials	Are you distracted by other apps when using the device? E.g. tweets, Facebook, surfing?
16. Finally, what are your thoughts on where mobile learning should go with midwifery education	Do you want more learning with devices Do you want less learning and use of devices	e.g. a course 100 per cent technology supported 50 per cent 0 per cent where would they put the line? Why?

